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ACUTE LARYNGEAL OBSTRUCTION*

AN ANALYSIS OF INSTITUTIONAL CASE-HANDLING.

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There may be little or no excuse for this paper's presentation at a Medical Society meeting, and probably you will conclude that it is a case of the author astride his hobby. While there is a genuine personal interest in the subject on the part of the writer, the data collected seemed to contain enough information to warrant offering it at this time.

When one thinks of acute laryngeal obstruction of more than moderate degree, there are visions of unpleasant experiences for the patient, anxious moments for the physician, and an unfortunate outcome in many cases. Few if any emergencies require as prompt treatment as those where there is interference with breathing through obstruction of the principal airway to the lungs.

As you no doubt fully appreciate, the majority of acute obstructing conditions in and about the larynx occur as inflammations in connection with the group of infections designated, for convenience, as the communicable diseases of childhood. If we exclude simple or spasmodic croup, this is certainly true.

For the care of these acute obstruction cases, there exists today, in most large cities, special hospital service where isolation of the infections can be carried out and adequate facilities provided for the type of care indicated.

It is our purpose to bring to you the results of a study of the records of a representative group of cases of laryngeal obstruction. Certain conclusions were reached, which it was thought might prove to be helpful suggestions for those of you whose practice brings these cases to your attention occasionally. The material comes from a well established department of a hospital for communicable diseases operated by a large eastern municipality for its taxpayers.

The cases included number 443 and were seen in the course of a continuous two year period. It was the writer's good fortune to have practically all of them under his observation.

Let us view briefly the method of handling cases of laryngeal obstruction in this institution. A hurry call from a physician reporting a case of laryngeal diphtheria is received. The ambulance is dispatched, and a trained attendant is sent whenever possible, with instructions to get certain facts in the history of the case, and return with the patient as promptly as possible. Only if life is actually threatened is he to entube at the home or en route to the hospital.

Arriving at the hospital, despite the seeming urgency, the case is examined by a trained resident physician in the admitting room of the diphtheria pavilion. This examiner receives the history brought with the case, attempts to exclude the various exanthemata, and makes an estimate of the location and character of the obstruction.

Particular care must be used to exclude measles and scarlet fever. If the history of the case includes an exposure to any other communicable disease, special arrangements for isolation have to be made. If the degree of obstruction demands prompt relief, the patient is removed to a room fully equipped for further examination and treatment of these cases.

The equipment here includes everything that might be needed for laryngoscopy, bronchoscopy, intubation, tracheotomy, and so forth. The cases are subjected to direct laryngoscopy; cultures are taken from the larynx; loose membrane or foreign bodies, if present, can be removed, and the larynx swabbed, medicated, or dilated if desired.

If intubation is indicated, the resident physician orders the size and type of tube to be used, and personally supervises the interns in a reasonable number of attempts at intubation. Should the assistants be unsuccessful, the tube

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is then placed by the resident. The patient is observed in order to establish that relief has been secured; antitoxin is administered; additional cultures as indicated are taken, and the case is sent to a special ward located close to this operating room.

PER CENT. OF MORTALITY OF DIPHTHERIA AT THE BOSTON CITY HOSPITAL PROPER, AND AT THE SOUTH DEPARTMENT, FROM 1888 TO 1905, INCLUSIVE. PER CENT. OF MORTALITY OF INTUBATIONS FOR THE SAME TIME

From 1888 to 1894, Antitoxin not used.
From 1895 to 1905, Antitoxin used.

DIPHTHERIA = ——— INTUBATION = ...

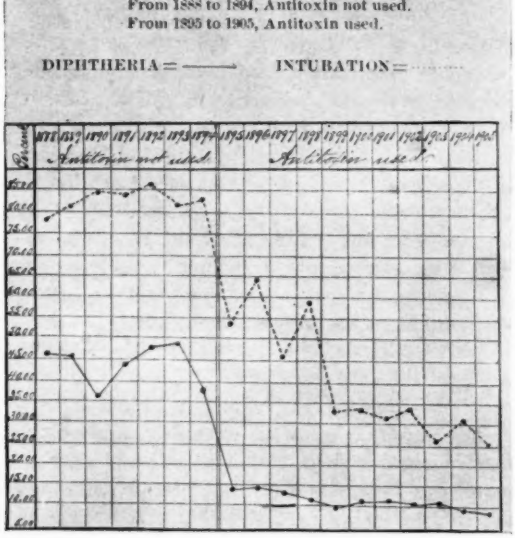


Chart A

Chart A is self-explanatory and is introduced for the sake of comparison with the condition existing at the time covered by this paper. (Reproduced from McCollom's History of the South Department, Boston City Hospital.)

Very careful supervision by nurses assigned to this special duty is imperative. An emergency call system operating from this ward enables the nurse to summon the resident on duty should occasion demand.

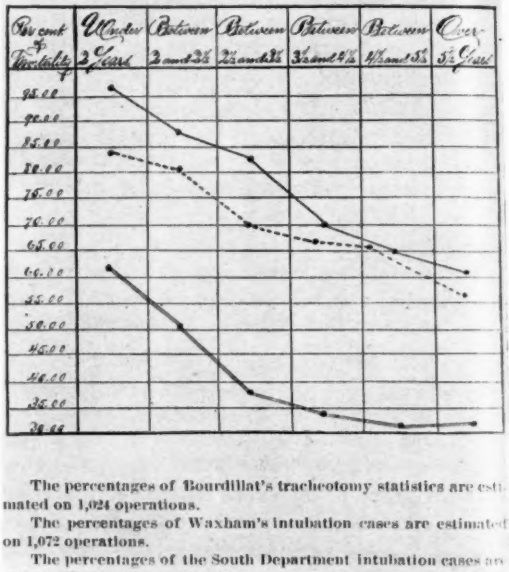
Such a routine covers the handling of these cases and is attended by many thrilling experiences. Frequently interesting conditions arise which demand prompt judgment, and often the employment of emergency measures for their relief.

You may ask why these cases were receiving care in a diphtheria pavilion. Of this series of cases with obstruction, 305, or 69 per cent, proved to be diphtheria. The non-diphtheritic cases can be protected against diphtheria by administration of antitoxin, and their stay in the institution made reasonably safe by the accurate use of the Schick test. Occasionally a non-diphtheritic case contracts diphtheria or becomes a temporary carrier.

The cases here described include in addition to the diphtheria infections, a fairly large group of cases simulating diphtheria which demand the same kind of treatment for relief. Streptococci are isolated from some of these. If sufficient cultural studies could be made, a variety of organisms would probably be found responsible for the non-diphtheritic group.

PERCENTAGE OF MORTALITY OF TRACHEOTOMY CASES AND OF INTUBATION CASES WITHOUT ANTITOXIN, AND OF INTUBATION CASES WITH ANTITOXIN.

Bourdillat's Tracheotomy Cases = ———
Waxham's Intubation Cases = ...
South Department Intubation Cases = ═══



The percentages of Bourdillat's tracheotomy statistics are estimated on 1,024 operations.

The percentages of Waxham's intubation cases are estimated on 1,072 operations.

The percentages of the South Department intubation cases are estimated on 1,671 operations.

Chart B

Chart B is offered to show the extremely serious nature of cases of acute laryngeal obstruction due to diphtheria, before the days of antitoxin.

Both Bourdillat's and Waxham's statistics are based on cases in which no antitoxin was used. (Reproduced from McCollom's History of the South Department, Boston City Hospital.)

Presenting interesting clinical pictures are the cases in another group, the greater number of which were sent in as diphtheritic obstruction because of the signs and symptoms. This series includes cases of measles, retropharyngeal abscess, epiglottic and subglottic edema, peritra-

TABLE 1
ADMISSIONS AND DISCHARGES
South Department Boston City Hospital

	1919-20	1920-21	1921-22	Total 1920-22
All admissions	2114	1917	1971	3888
Diph. admissions	995	872	1000	1872
Obstruction series	.....	201	242	443
Total discharges (including deaths)	2029	1901	2009	3910
Diph. discharges (including deaths)	.....	820	989	1809
Total deaths	128	148	132	280
Total mortality (percentage)	6.1	7.7	6.5	.....
Deaths within 24 hrs.	25	39	43	82
Deaths within 48 hrs.	40	60	52	112
Obstruction series				
Total deaths	.....	39	49	88
Deaths within 24 hrs.	.....	.....	.....	30
Deaths within 48 hrs.	.....	.....	.....	43
Mortality obstruction series (percentage)	.....	.....	.....	19.8

Note: 1919-20 is introduced for comparison. The two year period under consideration dates from Feb. 1, 1920, to Jan. 31, 1922.

TABLE 2
MONTHLY INCIDENCE OF ADMISSION

	1920 Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	1921 Jan.
Total admissions	211	185	169	181	149	142	95	92	120	143	207	223
Obstruction cases admissions	35	10	18	12	11	9	8	2	19	29	26	22

	1921 Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	1922 Jan.
Total admissions	153	196	201	193	139	107	109	101	170	200	107	195
Obstruction cases admissions	15	23	13	25	15	9	8	12	26	22	38	36

cheal inflammations, laryngismus stridulus, foreign body obstruction, laryngeal polyps, and others. Cases of laryngitis of varying degree, both simple and spasmodic, were not infrequently referred as suspected diphtheria, and occasionally admitted when there was a history of progressively increasing interference with breathing.

The 443 cases of acute laryngeal obstruction are a part of 3,888 admissions over the two year period covered. Of this total, the admission diagnosis was diphtheria in 1,872. When carefully analyzed, the diagnosis of laryngeal diphtheria was made in 305, or slightly over 16 per cent of all diphtheria admitted during the two year period (Table 1).

The total discharges from this institution closely paralleled the number of admissions each year and showed that approximately 7 per cent of all the cases died. In the series under consideration the deaths amounted to 19.8 per cent of the whole number of cases. Mortality from laryngeal obstruction of more than slight degree is high, though not as high as before treatment with diphtheria antitoxin was introduced, and intubation was more or less generally practiced. In this same hospital between 1888 and 1894 (that is before antitoxin was used) the diphtheria death rate was about 43 per cent, while mortality of obstruction cases which were intubed was 82.49 per cent.

The seasonal distribution of the admissions showed that the number of cases with obstruction was greatest in winter and spring; this in a measure corresponds with the high point among all admissions to the institution (Table 2).

There is practically an equal distribution of the sexes, both in the whole group and its subdivisions (Table 3).

Age grouping shows the usual preponderance of cases among children of pre-school age, although the largest number of cases is not in either of the first two years.

The case records under consideration divide themselves for convenience into obstructions due to diphtheria, non-diphtheritic inflammations with obstruction, and a small group of special conditions. Cases of obstruction due to diphtheria have been further subdivided into two groups, those with laryngeal involvement alone, and a larger group where the evidence of clinical diphtheria was found in the larynx and elsewhere.

The theoretical requisites for a diagnosis of diphtheria may be one thing, and the clinical evidence which forms a practical working basis for such diagnosis, another. Inflammation of the

TABLE 3
SEX DISTRIBUTION

	All cases		Deaths	
	M	F	M	F
Diph. Larynx	37	31	9	8
Diph. Larynx and elsewhere	112	125	23	20
Non-diph. with obstruction	59	57	12	5
Special	10	6	3	4
	218	219	47	37
		218		47
History wanting		6		4
Total		443		88

TABLE 4
ANTITOXIN DOSAGE

Group		*All Cases*				*Deaths*			
	Route used	No. cases	Average amt.	Largest dose	Smallest dose	No. cases	Average amt.	Largest dose	Smallest dose
Obstruction series	All	418	24	120	2	77	30	120	4
	Iv.	158	26	120	10	28	43	120	10
	Im.	70	20	40	3	14	19	40	10
	Sc.	171	18	80	2	34	19	80	4
All diphtheria	All	294	27.5	120	2	58	34.5	120	10
	Iv.	135	28	120	10	25	45	120	10
	Im.	43	24	40	3	9	24	40	10
	Sc.	99	21	80	2	24	23	80	10
Diphtheria larynx and elsewhere	All	228	30	120	2	42	40	120	10
	Iv.	114	30	120	10	23	49	120	10
	Im.	31	27	40	10	4	26	40	10
	Sc.	68	23	80	2	15	27	80	12
Diphtheria larynx alone	All	66	18	40	6	16	20	36	10
	Iv.	21	21	40	10	2	33	36	32
	Im.	13	16	30	3	5	22	30	10
	Sc.	32	17	34	6	9	16	34	10
Non-diphtheria with obstruction	All	112	15	70	2	14	16	40	4
	Iv.	21	18	40	10	2	35	40	30
	Im.	24	14	30	10	3	17	20	10
	Sc.	65	14.5	70	2	8	10.5	20	4
Special cases with obstruction	All	12	14	36	2	5	14	12	5
	Iv.	2	15	20	10	1	10	....	..
	Im.	3	11	12	10	2	12	12	12
	Sc.	7	11	36	2	2	8.5	12	5

Routes: All—all routes, Iv.—intravenous, Im.—intramuscular, Sc.—subcutaneous.
Note: The figures designating quantities of antitoxin are used to represent thousands of units of antitoxin. *i.e.*, 24 in the table above means 24,000 units of antitoxin. Any discrepancies in totaling the various groups can be explained by the fact that some cases did not receive antitoxin while others received it by more than one route, and are not included in the subdivisions of the various groups.

larynx associated with cultures positive for the diphtheria bacillus calls for a diagnosis of laryngeal diphtheria. To prove the virulence of all strains of organisms designated bacillus diphtheriæ is obviously beyond the facilities of the average hospital. To a certain extent we are aided in diagnosis by evidence of clinical diphtheria in locations other than the larynx. Response to treatment cannot be relied upon to offer assistance in diagnosis.

COMMENT

From the evidence collected in this series of cases there is little that is new to offer. The data presented serve to substantiate conclusions that have been arrived at previously, some of which however are deserving of being recalled to your attention.

Laryngeal diphtheria has a high mortality and the deaths in all cases of laryngeal obstruction due to diphtheria may be divided into those

TABLE 5
ANALYSIS OF DEATHS

Deaths—Time Relation to Admission

Group	No. cases	Death in 24 hrs.	Death in 48 hrs.	Days after admission: 3	4	5	6	7-14	Over 14
Diph. larynx	17	7	9	1	1	1	..	2	3
Diph. larynx and elsewhere	43	14	18	6	1	..	..	13	5
Non-diph. with obstruction	17	6	12	1	..	..	1	1	2
Special cases	7	3	4	..	..	..	..	2	1
History wanting	4								
Total	88	30	43						

Deaths—Age Distribution by Years

Group	1 & under	1-2	3-5	6-8	9-15	Over 15
Diph. larynx	4	5	6	2	..	..
Diph. larynx and elsewhere	3	12	18	5	2	3
Non-diph. with obstruction	8	6	2	..	..	1
Special cases	3	3	1	..	..	..
Total	18	26	27	7	2	4

Deaths—Days Sick Before Admission

Group	1	2	3	4	5	6	7 or over	Data wanting
Diph. larynx	3	2	..	1	1	..	2	8
Diph. larynx and elsewhere	2	5	5	4	5	5	2	15
Non-diph. with obstruction	4	1	1	..	3	..	1	7
Special cases	2	..	..	..	..	..	3	2
Total	11	8	6	5	9	5	8	32

Deaths—Relation to Complicating Factors

Group	No. cases	No. intubed	Pneumonia: A	B	C	Complications: Myocarditis	Paralysis	Toxemia
Diph. larynx	17	17	11	10	9	0	0	1
Diph. larynx and elsewhere	43	34	28	25	4	8	2	19
Non-diph. with obstruction	17	14	13	13	1	0	1†	4
Special cases	7	5*	7	4*	5	0	0	3
Total	84	70	59	52	19	8	3	27

Note: Under Pneumonia, A—total cases, B—intubed cases, C—pneumonia at entrance.
*Tracheotomies. †Facial paralysis in case with general tuberculosis.

from exhaustion, asphyxia, accidents in the mechanics of treatment, and pneumonia.

When only the larynx is involved, toxemia as a factor enters in far less than is generally supposed. The length of time patients are sick before treatment is started and the degree of obstruction are important as contributory factors. The exhaustion and diminished resistance when labored breathing is unrelieved are responsible, to a greater extent than toxemia, for many fatal cases or for the degree of illness encountered in others. In support of this contention it may be said that among the cases with only laryngeal involvement who survived the intubation period, in no case is there record of the characteristic toxic complications—paralysis or cardiac disturbance. This is true despite the fact that routinely this type of case due to diphtheria received smaller doses of antitoxin than any except nasal or mild follicular types of faucial involvement. In this series the average amount of antitoxin received by 66 cases with diphtheria of the larynx alone was 18,000 units as against 27,000 for all the diphtheria cases in the series and 24,000 for the entire group of obstruction cases (Table 4).

When the laryngeal involvement is accompanied by fairly extensive diphtheritic involvement in other parts of the respiratory tract or elsewhere, the danger depends upon additional factors. It is here that the time interval from onset of symptoms to proper treatment is most important, and the extent of the area involved is an index to possible toxic absorption. Unless the infection extends into the finer ramifications of the bronchial tree in cases with more than laryngeal involvement, the resultant toxemia is from absorption in regions about the throat and naso-pharynx rather than from the region below the glottis.

There is always the possibility of early absorption of toxin from smaller areas in the

TABLE 6

RECOVERED CASES IN OBSTRUCTION SERIES

Age Distribution of Cases

	One year and under	1-2	3-5	6-8	9-15	Over 15	Total
All diphtheria	6	37	120	59	12	4	238
Non-diph. with obstruction	14	21	37	14	9	4	99
Intubed Cases							
All diph.	6	25	84	32	6	..	153
Non-diph.	7	6	19	6	2	1	41
Complication							
Pneumonia							
All diph.	2	9	14	5	1	..	41
Non-diph.	5	2	1	..	..	1	9
Paralysis*							
All diph.	1	..	..	4	..	1	6
Myocarditis*							
All diph.	..	..	..	1	..	..	1

Days Sick Before Admission

	1	2	3	4	5	6	7	8	9	10	Over 10	No accurate history
All diphtheria	52	40	34	19	17	9	13	7	1	5	5	46
Non-diph. with obstruction	30	14	12	7	6	4	7	2	..	2	1	14

Days Stay in the Hospital

	1	2	3	4	5	6	7	8-14	15-21	22-28	Over 28
All diphtheria	..	..	..	..	..	3	..	18	73	49	95
Non-diph. with obstruction	..	2	2	4	6	6	5	22	24	8	20

*No cases among the non-diphtheritic group.

Note: The long stay in the hospital for many cases was due to the necessity of having cultures negative for the diphtheria bacillus from the nose and throat for three consecutive days before release.

course of the infection. If this is carried to vital tissues particularly susceptible to diphtheria toxin, there may be resulting damage. As a matter of fact, it is rarely seen. It is, however, one of the reasons why it is so important to get antitoxin into the blood stream as early as possible even though the quantity required be small.

In cases with extensive involvement, after the relief of the obstruction is accomplished, there is the necessity of getting the patients past the effects of the toxic damage to conduction tissues in the heart, and to the peripheral nerves. It is clearly pointed out that these cases are serious if antitoxin is not administered promptly and in adequate amount (Table 6).

Of the series of cases which had diphtheria in the larynx and elsewhere, the deaths numbered 43. Of these, 19 died with marked toxemia and in 8 cases myocarditis was present. Paralysis was noted in 2 cases where death resulted. The average number of days from onset of symptoms to death, based on 28 cases with definite history, was 4. The stay in the hospital for the 43 cases averaged eight days. If you exclude any who died after being in the hospital for twenty-one days or more, the average is brought down to 5. Obviously this is less time than is required for most cases to show the characteristic cardiac and nerve complications (Table 5).

If the amount of manipulation in mechanical treatment is increased above the minimum a proportionately greater incidence of deaths results. Where a record of the total number of attempts at intubation is studied, this contention is in part supported although more factors are responsible for death than the amount of instrumentation. Obviously it would be highly desirable to have all of the intubations done by skilled operators, but this is not always possible in a teaching institution where instruction in intubation is part of the program (Table 7).

If cases with laryngeal involvement are relieved by intubation and survive the treatment of the acute condition, there is still the danger of chronic stenosis of the larynx, which is quite another problem. No discussion of this problem is undertaken here. In this series are included only four cases, two of which died.

The problem of pneumonia is the most discouraging of all, for when relief from obstruction is accomplished and other factors are somewhat under control, pneumonia so often enters the picture, and claims a high proportion of the younger children. The location of the obstruction, the chances of infection because of the

TABLE 7

INTUBATIONS

Number of Occasions

	1	2	3	4	5	6	7	8	9	10	Over 10
Diphtheria larynx											
All cases	35	9	5	4	..	1					
Deaths	12	1	2	2							
Diph. larynx and elsewhere											
All cases	92	36	11	5	1	1					
Deaths	22	8	2		1						
Non-diph. with obstruction											
All cases	34	12	3	2	1					1	
Deaths	11	3	1								

Number of Actual Attempts

	1	2	3	4	5	6	7	8	9	10	Over 10
Diphtheria larynx											
All cases	15	7	7	6	4	2	4	..	2	..	7
Deaths	5	2	2	1	3	1	1	..	..	..	2
Diph. larynx and elsewhere											
All cases	46	23	19	17	8	7	7	4	2	4	10
Deaths	12	2	3	7	1	1	1	2	..	2	1
Non-diph. with obstruction											
All cases	15	9	7	3	3	3	4	2	1	..	5
Deaths	6	2	2	2	..	1	1	..	1	..	..

Note: By *occasions* are meant the various times it was necessary to remove the patient to the operating room to undertake relief of the obstruction present. In addition to the treatment at entrance, there were a number of times when it became necessary to reintubate patients, as for example, when tubes were coughed up or removed before relief was complete.

By *attempts* are meant the actual number of trials to place the tube in position in the larynx. Depending upon the degree of proficiency of the physicians, the attempts at intubation varied from a single effort, to many, before relief was secured.

very nature of the mechanical relief attempted, the lowered resistance of the patients on admission, and other factors, greatly increase the probability of contracting pneumonia. Once contracted, that disease is very difficult to combat, especially if the obstruction to breathing is still requiring mechanical relief.

Non-diphtheritic cases present difficulties similar to the diphtheritic. Especially is this true with regard to relieving the obstruction and combating the general toxemia. The mechanical obstruction is more apt to be due to edema and exudate than to membrane. The toxemia, when fatal, shows involvement of no special tissues unless it be those of the central nervous system when there is terminal depression. If, in addition to the laryngeal involvement, there is a cellulitis of the neck in either diphtheritic of streptococcic cases the condition is made much more serious. The deep cervical tissues are a source from which there is rapid absorption of toxin. Because of the anatomic relations in this situation, swelling often renders intubation impracticable or impossible and necessitates tracheotomy.

Pneumonia deaths occur with about equal frequency in the diphtheritic and non-diphtheritic groups.

Among cases in the group designated "special" many things occur which should be readily differentiated from diphtheria, and others are noted which if in any measure resembling diphtheria, should receive antitoxin promptly. Note especially measles. As an example this series contains several cases which had measles and diphtheria of the larynx coincidently and of course needed antitoxin. It is never a mistake to give antitoxin to a case of measles with beginning laryngeal stenosis. Retropharyngeal abscess, foreign bodies and laryngismus stridulus give sufficiently characteristic histories and clinical pictures so that they should be readily recognized.

Ingestion of corrosives and the various edematous swelling above and below the glottis may simulate diphtheria and may require intubation or tracheotomy. Certainly such patients should receive antitoxin to be on the safe side. It is not a good plan to incise a peritonsillar cellulitis due to diphtheria as was done in one

case mistaken for peritonsillar abscess. Death resulted less than 24 hours later. Careful histories in these cases will aid in the differential diagnosis.

Simple croup is but a form of laryngitis and when we are dealing with a diphtheria-immune community it will present less difficulty than at present. It is not enough that a physician see and prescribe for simple croup at a single visit. The case should be followed until it is apparent that there is a slight intermittent difficulty responding to appropriate treatment, rather than a progressively increasing stenosis.

In connection with tonsillectomy it has been wisely said that all cases should have a preliminary Schick test or nose and throat culture or both. It is probably safe to say that less than 1 per cent of tonsillectomies are preceded by this precautionary measure. Seven cases with one death in this series more than justify urging such a safeguard. The clinical picture after tonsillectomy is often difficult to distinguish from diphtheria and certainly it is easy enough for diphtheria to be superimposed upon the throat laid open by tonsillectomy in a susceptible individual.

With regard to handling laryngeal diphtheria or other cases with obstruction to breathing in the home or in a general hospital, it should be remembered that all facilities for any emergency must be provided and the patient be under constant attention of an attendant competent to meet these emergencies. This type of care is occasionally provided in the home, but it is obviously limited to special cases.

CONCLUSIONS

1. Laryngeal diphtheria is a very serious condition generally necessitating treatment in a special type of institution.

2. Deaths from laryngeal diphtheria depend upon many factors. In order to obtain the lowest possible mortality, there must be prompt recognition and early treatment by skilled attendants.

3. Many cases of laryngeal obstruction due to causes other than diphtheria require treatment similar to that given diphtheria cases.

4. Cases simulating diphtheria should receive diphtheria antitoxin.

5. It is highly desirable that special hospital services to provide instruction in the treatment of acute laryngeal obstructions be maintained. There will obviously be some disadvantage to the patients under these circumstances.

6. Universal adoption of active immunization against diphtheria should be urged as a means to promptly reduce diphtheria morbidity and mortality.

ACKNOWLEDGMENT

To Dr. E. H. Place, physician-in-chief of the South Department Boston City Hospital, the writer wishes to express his sincere appreciation for valuable teaching and for permission to use the case records, from which the data for this paper were secured.

Winona Clinic

O-IODOXYBENZOIC ACID IN THE TREATMENT OF INFECTIOUS ARTHRITIS

The Council on Pharmacy and Chemistry publishes a preliminary report on the treatment of infectious arthritis reported on by Drs. Young and Youmans. The authors report that they have treated forty-three cases of chronic arthritis of various types with o-iodoxybenzoic acid and had obtained marked improvement in 50 per cent and moderate improvement in 29 per cent. In some cases sodium iodoxybenzoate was used; in others ammonium iodoxybenzoate, prepared extemporaneously. The Council states that the results of further clinical trials must be awaited before a final evaluation of this method of treatment can be made. The drug is not commercially available at present. The A. M. A. Chemical Laboratory is prepared to examine salts of o-iodoxybenzoic acid when they are placed on the market. (Jour. A. M. A., Sept. 4, 1926, p. 757.)

YEASTONE (MERCK & CO.)

The advertising circular claims that Yeastone is "useful in chronic constipation, digestive disorders, acne, furunculosis and in the deficiency diseases" and asserts that "in therapeutic activity a 1½-grain pill corresponds to one yeast cake." New and Non-official Remedies, 1926, under "Yeast Preparations," discusses the propaganda that has been made in favor of the therapeutic use of vitamin B preparations, and states that "at all events, the alleged curative or tonic value of special vitamin B bearing products has been emphasized through widespread advertising to an extent unjustifiable by available evidence." A report of the Connecticut Agricultural Experiment Station reports feeding trials with Yeastone: "No satisfactory growth was secured in any of the trials. Two cases developed polyneuritis, one of which was acute. The results do not show any merit in the product from the standpoint of water-soluble B vitamin." (Jour. A. M. A., Sept. 25, 1926, p. 1055.)

X-RAY OBSERVATIONS IN PNEUMONIA*

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In view of the extensive utilization of the roentgenogram in the diagnosis and observation of chronic lung conditions, it is surprising that more attention has not been paid to its importance in the acute pulmonary infections, especially the pneumonias. The pathological condition in pneumonia is such that it can be reproduced very clearly by the means of the roentgen ray. The large amount of heavy exudate thrown out into the alveolar cavities produces a distinct shadow, sharply in contrast with the remainder of the air-filled lungs. The mediastinum and diaphragms afford a ready means of ascertaining the pressure changes which are taking place in the thoracic cavity and help to demonstrate the effects of the formation of scar tissue. In the case of the acute lung conditions the roentgenogram, in truth, presents an "autopsia in vivo," requiring only adequate and intelligent interpretation to make it the most valuable adjunct in the diagnosis and study of pneumonia. By means of serial roentgenograms, taken at intervals, the changes taking place from time to time may be studied and appraised. No better method exists for the pre-mortem study of lung pathology. Frequently the difficulties in interpretation are found to compare favorably with those experienced by the pathologists in the gross examination of the tissues. Sante[1] has recognized this and has, by this means, presented considerable new information as to the onset and course of pneumonia. The following findings are based upon the observation of over 450 cases of pneumonia and other acute pulmonary conditions in which serial roentgenographic studies were made at the Minneapolis General Hospital.

When dealing with acutely ill patients the technic becomes a matter of considerable importance. A bedside *x*-ray machine was used during the acute stages of the illness. The film was placed underneath the patient, the tube above; he was moved slightly and then held his breath for one or two seconds, following which the film was removed. Every attempt was made to avoid undue exertion and, with the use of a bedside machine, the patient was put to much less inconvenience than for even a superficial physical examination.

The first question that arises in an acute pulmonary condition is whether or not there is parenchymal pathology present. This is of particular importance in two groups of cases, especially in children. In the first group we have those cases in which an acute abdomen, commonly acute appendicitis, is suspected and it is difficult to be certain that the findings are not due to beginning right lobar pneumonia. We have found the roentgen examination of the lungs so valuable in this group of cases that it is now a routine procedure at the General Hospital in all children suspected of an acute abdominal condition. A surprisingly large number of cases have had a clinical diagnosis of acute appendicitis made only to find a lobar pneumonia on *x*-ray examination (Fig. 1A). On the other hand, in the presence of an acute abdominal condition, we have found dullness at the right base and coarse râles which threw grave doubt on the advisability of operation. A roentgenogram in these cases reveals a high fixed diaphragm, due no doubt to the splinting effect of pain, without any abnormal pulmonary shadows, thus ruling out pneumonia (Fig. 1B). In the second group of cases we have the difficult task of deciding whether a child has acute bronchitis or bronchopneumonia. These cases present symptoms of pneumonia often without consolidation being present. It is obviously importaant from the standpoint of treatment and prognosis to make this determination. An essential difference between acute bronchitis and bronchopneumonia exists in the roentgenogram. The latter has, in addition to the marked congestion and the prominent vascular markings of the former, small or large clumped shadows or nodules which are easily distinguished from the streaked narrow shadows of the congested vessels.

Lobar pneumonia may arise in two ways. If seen early enough the shadow may be entirely peripheral, a triangular, homogeneous opacity with its base at the periphery, its apex at the hilum (Fig. 1C). This will most often be seen to extend to a whole lobe after a day, although occasionally in children it goes no further. The

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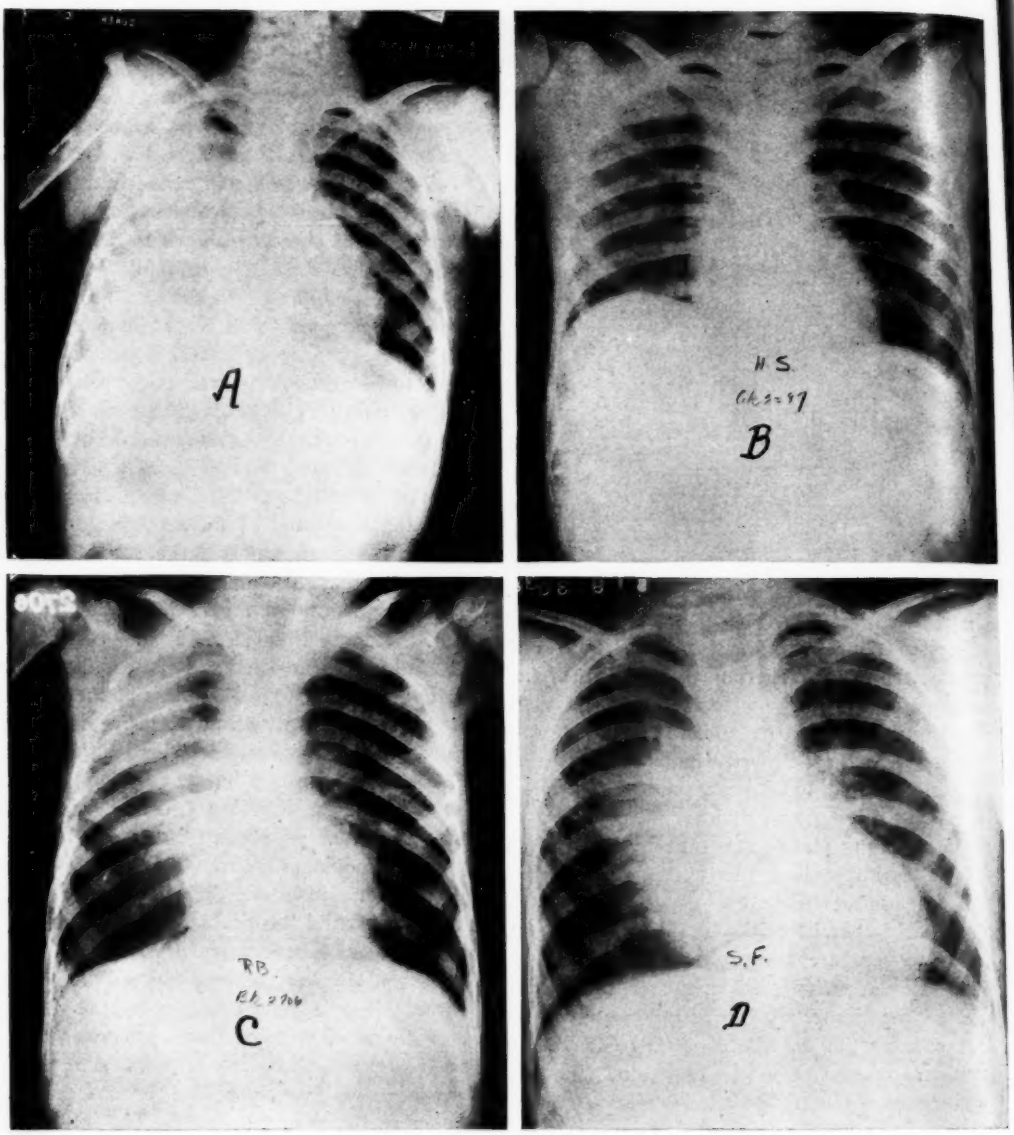

Fig. 1. A. Case suspected of acute appendicitis. Note typical heavy shadow of lobar pneumonia shown 24 hours after onset of symptoms. Patient complained of pain in McBurney's area.

B. Case of acute appendicitis with physical findings in right lung suggestive of beginning pneumonia. Note the high right diaphragm and decreased aeration of right lung.

C. Peripheral form of onset of right upper lobar pneumonia. Note the dense triangular shadow with base at periphery.

D. Central form of onset of lobar pneumonia. There were no physical findings at this time owing to the deep-seated location of the consolidation.

other and less common mode of onset in adults, but probably more common in children, is the central origin. A large, fairly dense shadow will be seen extending out from the hilum toward the periphery, somewhat rounded with an irregular, blurred outer border (Fig. 1D). In most cases, this extends out to involve a whole lobe or possibly a whole lung within one or two days. Not infrequently in children there is no extension, the whole process remaining central and resolving

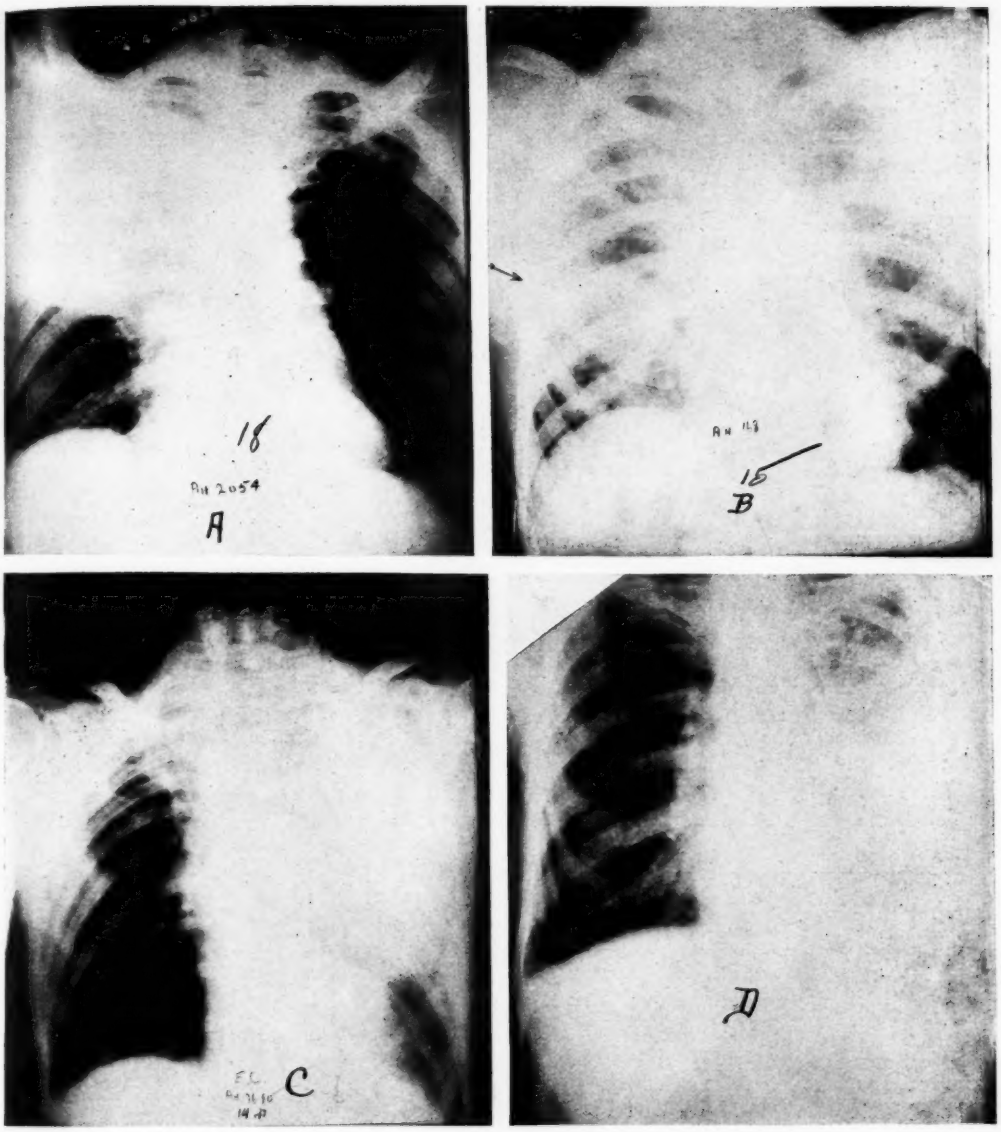

Fig. 2. A. Right upper lobar pneumonia. Note the sharp lower border of the shadow.
B. Right middle lobar pneumonia. Note the sharp upper border and blurred lower border of the consolidation.
C. Left upper lobar pneumonia. Note the density of the shadow in its upper portion and its thinness in the lower portion.
D. Left lower lobar pneumonia. Note the thin shadow in the upper portion and the denser character of it in the lower portion.

there. These are the cases which puzzle the clinician; the patient has all the classical symptoms of pneumonia without any of the characteristic physical signs. The pathological process is so deep-seated that the physical findings are not apparent at the surface and the consolidation is extremely difficult to detect. I have seen only one such case in an adult. The roentgen examination is very clarifying under these circumstances. Abortive pneumonia may also occur in this type of case. We have found that most of the cases diagnosed abortive pneumonia clini-

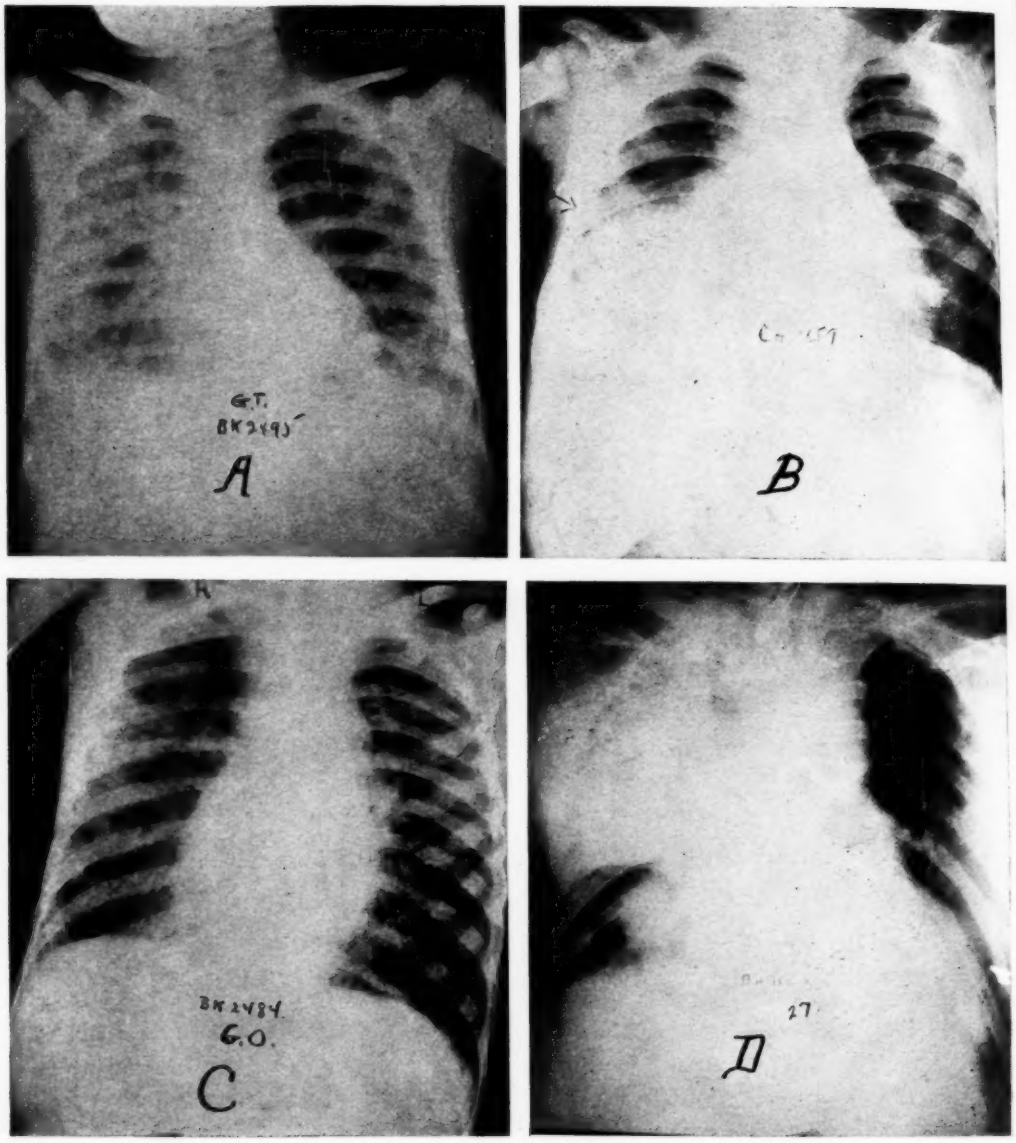

Fig. 3. A. Multiple bronchopneumonia. Note the nume rous smaller and larger densities throughout the lungs in addition to the increased vascular markings.

B. Coalescent bronchopneumonia. This is shown by an irregular mass at the right base in addition to several smaller shadows above.

C. Capillary pneumonia following measles. Note the multiple small nodules from apex to base on both sides and some tendency toward coalescence in both upper lobes. The resemblance to acute miliary tuberculosis is marked. This patient had a congenital heart lesion also.

D. Extension of lobar pneumonia. The right upper lobe is completely consolidated and a central consolidation in the middle and lower lobes is shown, the latter two not being completely consolidated as yet.

cally, show no consolidation whatever and are no doubt severe cases of acute bronchitis. We have, however, recently seen a case in which the first roentgenogram (Fig. 4A) was made twenty-four hours after the onset of symptoms and showed a central consolidation extending into the left lower lobe. Within twenty-four hours all the symptoms had disappeared and likewise the *x*-ray

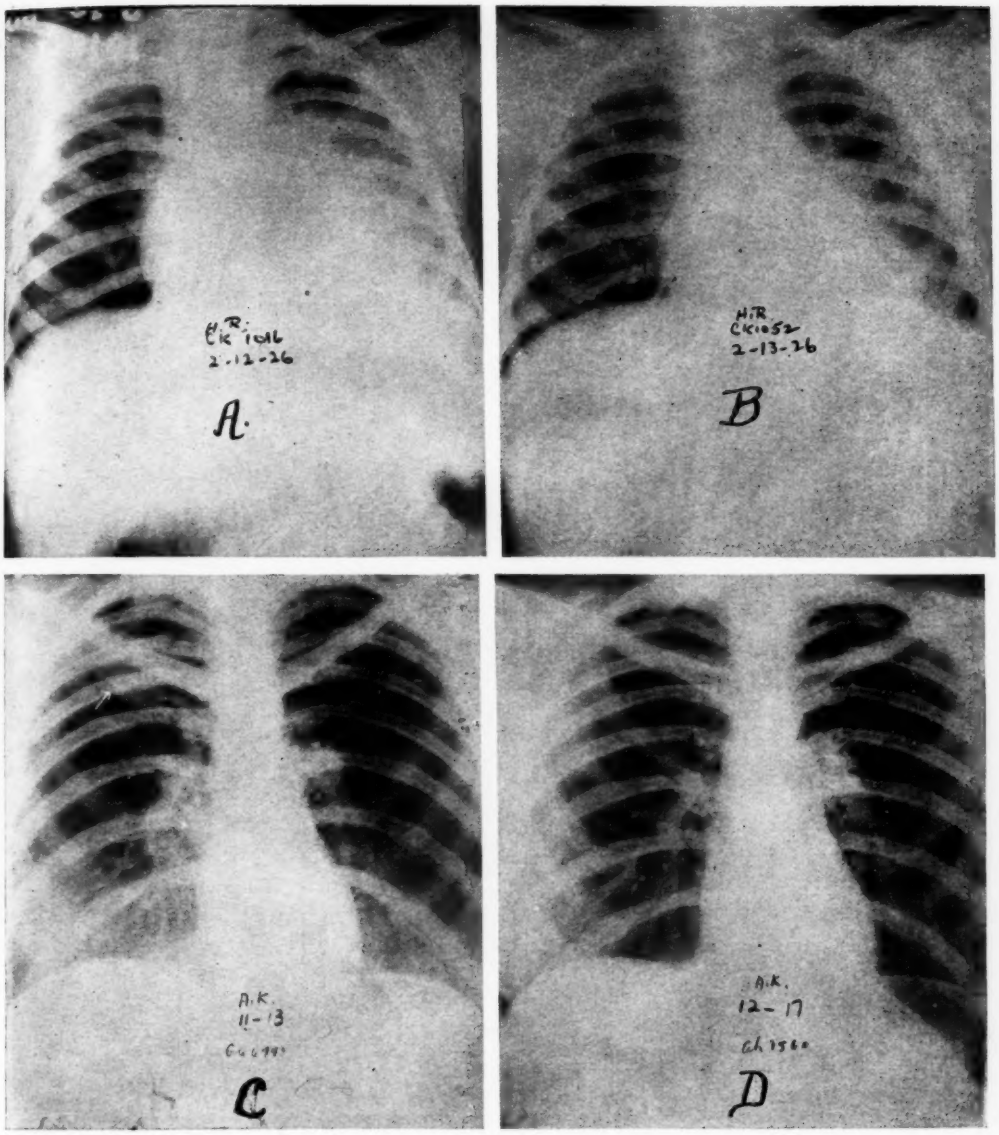

Fig. 4. A. Abortive pneumonia. Shadow present in left lung twenty-four hours after onset typical of lobar pneumonia of central origin.

B. Same case twenty-four hours later. The physical signs and the symptoms had all disappeared and likewise practically all the shadow which was present.

C. Localized bronchopneumonia associated with influenza simulating early tuberculosis. Note the shadow in the right subclavicular region characteristic in type and location of early adult tuberculosis.

D. Same case five weeks later. The shadow has entirely disappeared along with the symptoms indicating complete resolution and its non-tuberculous character.

findings (Fig. 4B), the lung being entirely clear. This, however, is extremely unusual.

Because of the difference in the distribution of the lobes in the two lungs, there is an essential difference in the type of shadow produced by lobar pneumonia on each side. Right upper lobar pneumonia (Fig. 2A) is characterized by a dense shadow, the lower border of which is sharply defined and almost straight across from the lateral to the medial border of the lung. In

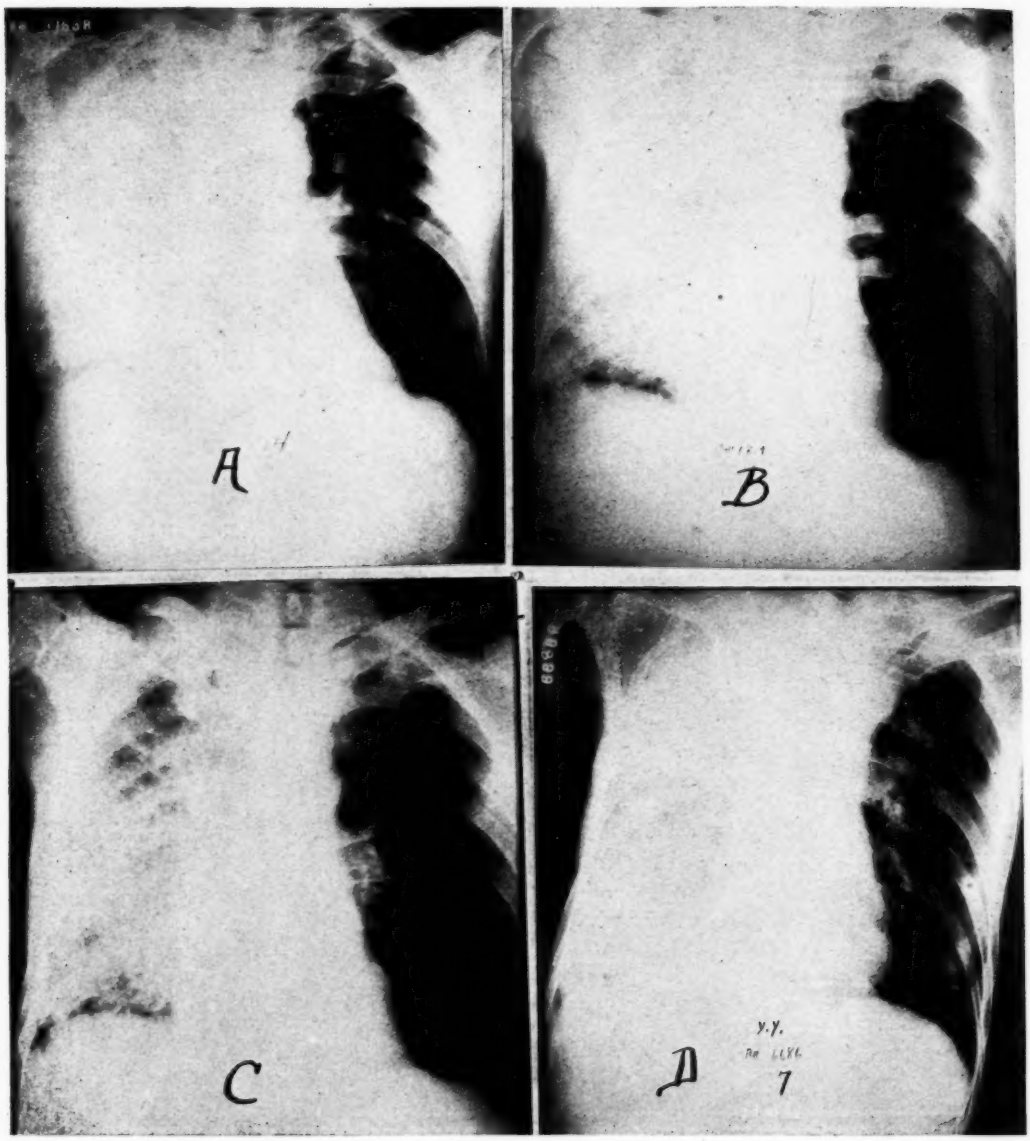

Fig. 5. A. Resolution of right lobar pneumonia. Findings at crisis. The shadow is still dense and homogeneous.
B. Same case twenty-four hours later. There is marked increase in resolution, many clear areas now appearing.
C. Same case six days after crisis. Note the multiple feathery masses and the marked peribronchial infiltration which are still present.
D. Unresolved pneumonia six weeks after the acute condition had subsided. There is a dense, sharply demarcated shadow in the right upper lobe which at post-mortem proved to be organizing unresolved pneumonia. There was also a small encapsulated empyema at the base as shown.

right middle lobar pneumonia (Fig. 2B) the upper border is also sharp and straight, corresponding to the lower border of the upper lobe. The lower border of the middle lobe is not well defined, tends to be blurred, and extends rather obliquely, forming a triangle with the base at the hilum. Usually right lower lobar pneumonia is combined with the middle lobar and tends to form a shadow extending up to the middle of the lung. If the focus of the tube is high enough, a clear space can be seen between the lower border of the consolidation and the diaphragm.

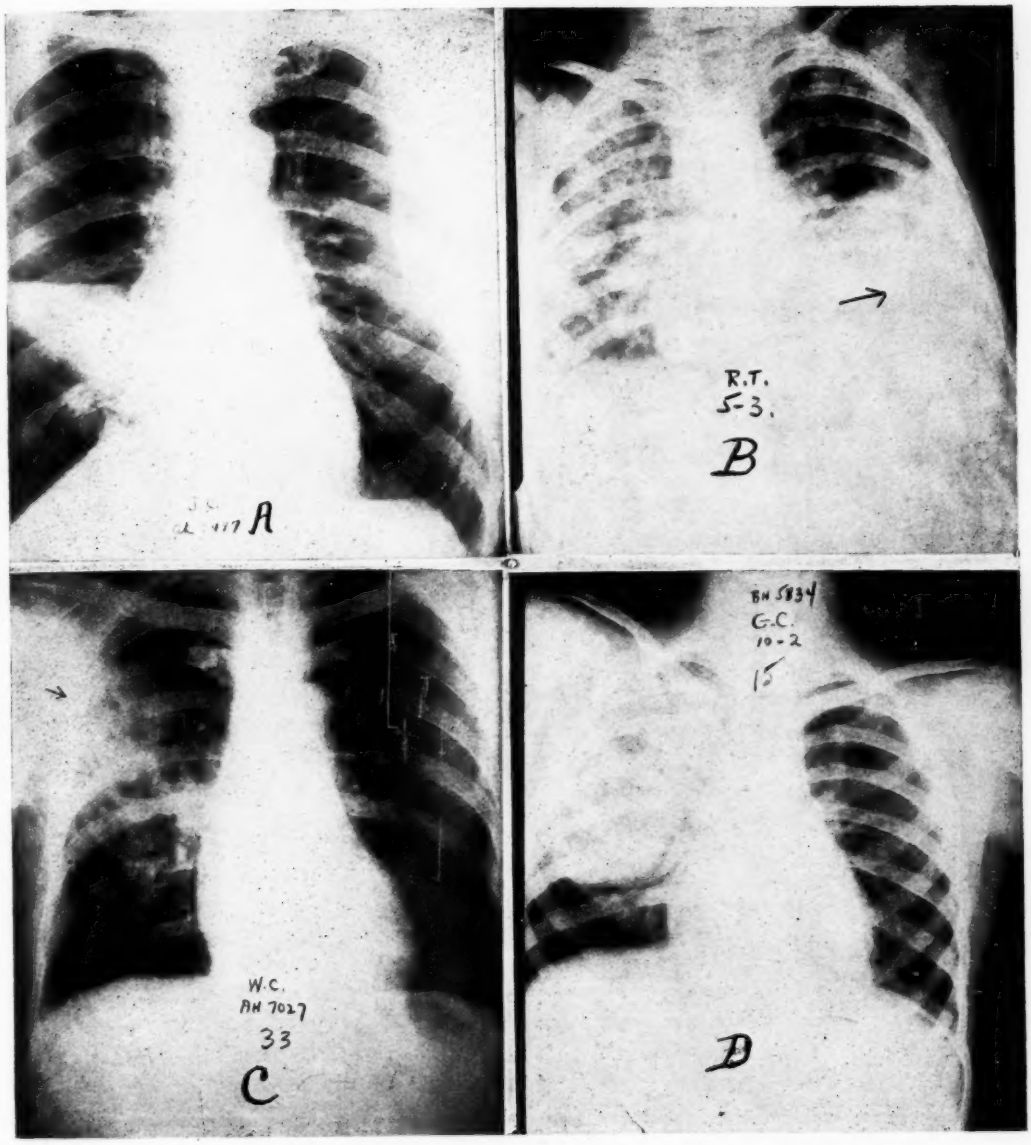

Fig. 6. A. Interlobar and diaphragmatic pleurisy following pneumonia. Note the triangular shaped shadow between the middle and upper lobes on the right with its base at the hilum characteristic of interlobar empyema. Note also the tent-like projection in the inner portion of the diaphragm.

B. Resolving pneumonia in the right lung and beginning empyema in the left. Note the dense, homogeneous shadow, the obliteration of the diaphragm and costophrenic sinus, and the slight displacement of the heart and trachea to the right.

C. Acute pulmonary abscess. Note the feathery edge of the shadow in the right upper lobe, its irregularity, and the area of clearness within it.

D. Encapsulated empyema in the upper lobe. Note the sharp rounded border, the lack of lobar distribution, and the loculated character of the shadow.

This helps to distinguish lower lobar pneumonia from pleural effusion. On the left side, the difference lies chiefly in the absence of the sharp interlobar lines, due to the oblique direction of the lobes and the fact that the upper lobe extends down so far anteriorly while the lower lobe extends upward posteriorly. As a result, in left upper lobar pneumonia (Fig. 3C) there is a dense shadow extending from the apex to the third interspace anteriorly and a thinner shadow extend-

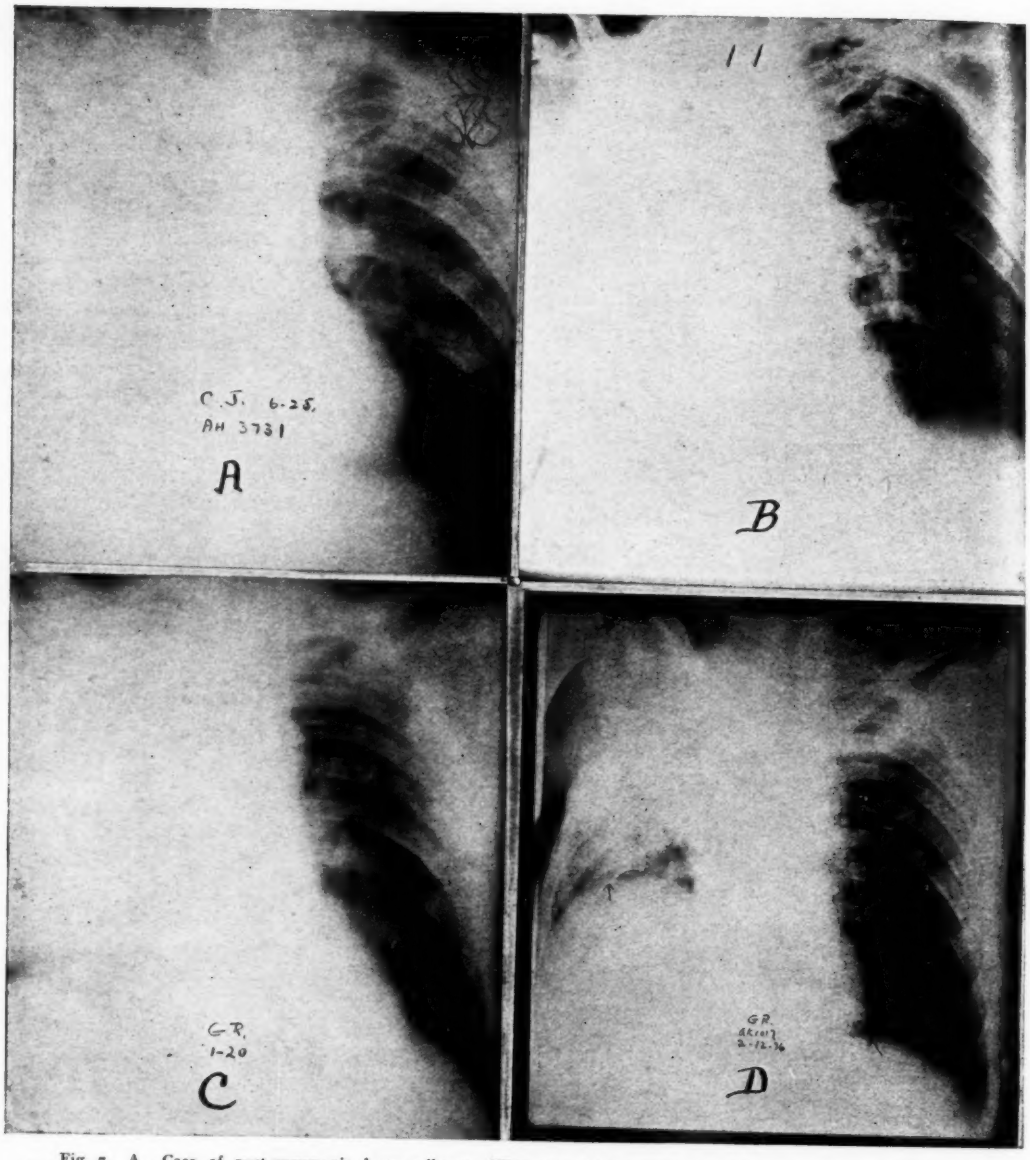

Fig. 7. A. Case of post-pneumonic lung collapse. Film taken before onset of collapse showing typical whole right lobar pneumonia. Note the normal position of the diaphragm, heart, and trachea.

B. Same case seven days later and twenty-four hours after a severe attack of dyspnea and cyanosis. The displacement of the heart and trachea toward the side of the lesion are well shown.

C. Case of unresolved pneumonia and post-pneumonic lung collapse. First film taken shortly after onset of lobar pneumonia shows typical whole right lobar pneumonia. Note the dense shadow throughout the whole right lung with the clear area above the diaphragm characteristic of lower lobar pneumonia. Note the normal position of the diaphragm and mediastinum.

D. Same case twenty-two days later. Note the dense shadow in the right upper lobe representing unresolved pneumonia. The high right diaphragm and the marked displacement of the mediastinum toward the side of the lesion are well shown. At post-mortem organizing pneumonia in the right upper lobe and extensive atelectasis in the lower lobe were found confirming the roentgen diagnosis.

ing down to the fifth rib. Likewise left lower pneumonia (Fig. 3D) shows a dense shadow just above the diaphragm up to the fourth rib anteriorly with a thinner shadow extending up to the third rib posteriorly.

Bronchopneumonia may manifest itself as a

number of dense shadows of smaller or larger size scattered diffusely throughout both lungs (Fig. 3A). Frequently the small patches of consolidation coalesce, producing a fairly opaque shadow, irregular in type (Fig. 3B). Following measles, we have seen a number of cases of capillary pneumonia (Fig. 3C). In this condition the lungs are dotted with small densities from apex to base. The picture closely resembles that of acute miliary tuberculosis except that the nodules are somewhat larger and tend to coalesce more. Clinically, these patients resemble miliary tuberculosis also, tachypnea and cyanosis being prominent signs. Usually they clear up within a week or two, which determines the diagnosis finally. This type of picture is seen very seldom and seems to have been unusually prevalent in this present epidemic of measles.

Another form of bronchopneumonia which we have observed recently in a number of cases is very easily confused with early tuberculosis both clinically and roentgenologically. In these cases, during the course of a fairly mild, acute, respiratory infection, somewhat resembling mild influenza, the temperature never rising above 102° F., *x*-ray examinations of the chest were made. A moderately heavy shadow, varying in size, was found in the right subclavicular region, its appearance and location being typical of early adult tuberculosis (Fig. 4C). Nevertheless, in a period of three to six weeks, re-examination (Fig. 4D) revealed no shadow whatever indicating that complete resolution had been accomplished. This never occurs in tuberculosis without leaving some characteristic residue. The process is simply a localized bronchopneumonia associated with an attack of influenza.

The progress of pneumonia can be well demonstrated by serial roentgenograms from day to day. Extension of the process to involve a whole lobe, a whole lung, or even both lungs, is well shown. We have observed one case in which the process began in the right upper lobe. A few days later a roentgenogram (Fig. 3D) revealed a consolidation in the center of the right middle lobe and another in the lower lobe. At this time each lobe could be distinguished by the consolidation within it. In other cases the complete extension of a fulminating pneumonia to involve both entire lungs has been observed with eventual death. In the bronchopneumonias, coalescence (Fig. 3B) may thus be observed, producing a graver prognosis.

When crisis occurs there is little or no change in the appearance of the roentgenogram (Fig. 5A). Within twenty-four hours, usually, a slight breaking up of the dense shadow may be made out (Fig. 5B). As resolution continues, a very characteristic picture (Fig. 5C) is presented wherein the lung is mottled with irregular feathery masses. Peribronchial infiltration is finally shown and within ten to twelve days in the ordinary cases the resolution may be complete. During the last epidemic resolution took place much more slowly, many of our cases remaining unresolved for several months, with eventual clearing. Unresolved pneumonia is not really as infrequent as it was once believed to be. We have seen a number of cases presenting a very dense shadow (Fig. 5D) months after a pneumonia which at post-mortem proved to be organizing, with small multiple abscesses within it. Occasionally these cases are mistaken for lung abscess, encapsulated empyema, and lung tumors. They can be differentiated from abscess, roentgenologically, by their sharper border and lack of cavitation. Encapsulated empyema is not lobar in distribution, tends to produce a triangle with its base at the hilum rather than at the periphery, and is usually more homogeneous. Lung tumors cannot be differentiated unless the patient has been studied by serial roentgenograms. In many cases resolution may take place to a large extent, leaving small residues near the hilum which may remain for long periods of time, often giving symptoms. Interlobar pleurisy, especially on the right side, is a very common residue, occurring in lobar pneumonia with great regularity and often remaining permanently. This is manifested by a sharp, white line of varying thickness, corresponding in location to the interlobar fissure. Interlobar empyema (Fig. 6A) may give a diamond-shaped shadow or a triangular-shaped shadow with its base at the hilum. The fact that many small interlobar empyemata resolve spontaneously is shown by repeated *x*-ray examination. Diaphragmatic pleurisy (Fig. 6A) is also a frequent accompaniment and may manifest itself permanently by tent-like projections and a high position of the diaphragm.

The early determination of the onset of empyema or a serous pleural effusion is of consider-

able importance and is often difficult to diagnose from the physical signs and symptoms. The roentgen appearance of pleural effusion is characteristic. The shadows of the diaphragm and costo-phrenic sinus are obliterated; the heart and trachea are usually displaced to the opposite side; in many cases a typical "fluid level" may be made out. By serial roentgenograms the time of onset of the complication (Fig. 6B) may be determined with accuracy, and prompt treatment may be instituted. In a few cases there is difficulty in distinguishing unresolved pneumonia from effusion. The former does not give as homogeneous a shadow as fluid and does not exhibit the cardinal signs described above. The other common complication of pneumonia, acute pulmonary abscess (Fig. 6C), is also difficult to distinguish from unresolved pneumonia. Lung abscess is not lobar in distribution, has an irregular, feathery outer border, and may show an area of lessened density in its center, the area of necrosis. Encapsulated empyema may also occur outside the interlobar line (Fig. 6D). This is sharply demarcated, may show loculation within it, and is usually rounded. A lateral view may demonstrate it to be attached to the anterior or posterior chest wall.

We have observed in three cases an unusual type of complication which could readily be determined only by *x*-ray examination. During the course of lobar pneumonia, about six days after the onset, there developed, in one case, a sudden attack of dyspnea, cyanosis, and extreme distress, remaining for about twenty-four hours. A roentgenogram (Fig. 7A), taken before this attack, revealed a typical lobar pneumonia involving the whole right lung. The heart, trachea, and diaphragm were in normal position. Another film (Fig. 7B), taken shortly after this attack, revealed the heart and trachea displaced markedly to the right, to the side of the pneumonia, not away from it as in pleural effusion. The diaphragm on the affected side moved upward. Eventually resolution took place although it was prolonged, and the mediastinum was replaced in normal position. In another case the process went on to involve both lungs, terminating in death. The whole appearance is typical of atelectasis or pulmonary collapse, which evidently supervenes as a complication affecting those alveoli which are not consolidated. The movement of the diaphragm upward, of the mediastinum toward the side of the lesion is characteristic of pulmonary atelectasis and can be well demonstrated in the roentgenogram. In another case it occurred in association with unresolved pneumonia of the right upper lobe. In this case there was first shown the typical appearance of whole right lobar pneumonia (Fig. 7C). Resolution took place in the middle and lower lobes but the upper lobe remained solid. The diaphragm was then observed to move upward and a diagnosis of sub-diaphragmatic abscess was considered. The heart and trachea, however, were displaced toward the side of the lesion, identifying it as a pulmonary collapse (Fig. 7D). At post-mortem. organizing pneumonia of the right upper lobe was found with extensive atelectasis in the lower lobe. This condition must be distinguished from post-operative massive collapse of the lung in which the atelectasis comes on shortly after operation or injury without any preceding pneumonia or infection.

SUMMARY AND CONCLUSIONS

1. The roentgen examination of the lungs affords an excellent means for the diagnosis and study of acute pulmonary conditions and can often reproduce the pathology very exactly.

2. The presence of pneumonia, its type, distribution, and extent can be accurately determined in this way.

3. Particular attention is directed to capillary pneumonia following measles and a form of localized bronchopneumonia simulating early tuberculosis.

4. Serial *x*-ray studies will demonstrate extension of the pneumonic process and the various stages of resolution.

5. Unresolved pneumonia and other residues can be determined definitely. Interlobar pleurisy is seen very frequently following lobar pneumonia.

6. The complications of pneumonia, especially empyema, can be diagnosed very early in the roentgenogram.

7. An unusual complication of pneumonia, pulmonary collapse, is described in detail.

REFERENCES

1. Sante, L. R.: Am. Jour. Roentgenol. 10, 351, 1923. Radiology, 4, 221, 1925.

SURGICAL TREATMENT FOR RESIDUAL INFANTILE PARALYSIS*

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Before any operation is undertaken, the first duty of the surgeon is to be sure that the patient is a proper subject, that the operation is the proper one for the lesion, and, last but not least, that the time selected is the proper time. This is particularly true of operations for infantile paralysis. Although a multitude of procedures have been advocated for the relief of various residual disabilities and deformities that follow anterior poliomyelitis (and it is difficult to describe in a general way the operative treatment of infantile paralysis) I shall endeavor briefly to outline certain basic principles.

SELECTION OF CASES

Sufficient time must have elapsed between the onset of the disease and the time of operation to make certain that the maximum of improvement has occurred in the paralyzed muscles. No definite time can be set, but it is generally accepted that plastic operations should not be performed within less than eighteen months. If there is deformity, manipulations or tenotomy may be necessary within less time. As a rule, some idea of the degree of power that can be expected to return in a given muscle can be obtained within a year. If paralysis of both lower extremities is complete and there is no deformity, it is very evident that operation will not help the patient. Such a patient may, by the aid of crutches, manage to drag himself about by tripod walking. The late Dr. R. W. Lovett made the statement, "Patients who come with infantile paralysis to the surgeon might be divided into two distinct classes: those who cannot walk and wish to walk; and those who can walk but wish to be made to walk better." The paralysis may be so distributed that operation is of questionable value, particularly in cases in which the hip muscles are paralyzed, while the foot muscles are fairly good. In some such cases if the hip were less involved, one might consider, for example, transferring the peroneus longus to the inner side of the foot to aid a weakened tibialis anticus, but because of marked disability higher in the leg is hardly worth while. If such operation is performed the patient or the parents should be warned that the operation will not relieve the limp which is due to a paralysis of the hip. The social status of the patient is an important factor in treatment. If he is a wage earner with a dependent family, stability must often be secured at the cost of comfort. A stiff hip or knee is uncomfortable in certain conditions, such as sitting, but it may give sufficient stability to allow the patient to stand for long hours without fatigue. In cases of this type more than any other, each patient should be studied to ascertain the treatment which will be most beneficial. No age limit can be set arbitrarily for operative procedures. If tendons are transferred, the patient must be mature enough to coöperate intelligently in the training of the muscle in its new duties. Rarely will a child less than eight years of age coöperate in this manner. Arthrodesis is best carried out about puberty or later, but operations for the correction of deformity may be performed at any age.

TYPES OF OPERATIONS

Operations for infantile paralysis are of two types: (1) operations undertaken primarily to correct deformity, thus putting the part in normal alignment and the muscles in a better position to use advantageously what power they have; operations of this type are manipulations, tenotomy, removal of bone, osteotomy, or the changing of the origin of a muscle to a different location; and (2) operations to increase function. either plastic operations on the tendons, or arthrodesis through increasing stability; operations of this type are tendon transference, the tenodeses, bony fusions, and bone block operations. In many cases a combination of the two types is employed.

PROCEDURES FOR THE CORRECTION OF DEFORMITY

Manipulations.—The old saying that the best way to cure a disease is to prevent it is most applicable in considering the deformities which are due to anterior poliomyelitis. Proper supervision will prevent practically all deformities. When they do exist to such an extent as to prevent or interfere with function, they should be corrected. Often this can be done by simple manipulation.

Deformities are caused by the overacting of the non-paralyzed muscles and by the action of gravity. The patient should be anesthetized and manipulation gently but firmly carried out. Adhesions must be broken gently, and the muscles

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stretched; the force should not be abrupt but steady, and characterized by regular partial relaxation, as tissue can be made to stretch more readily by such means. The part should be held in proper position after the correction, or the deformity will recur.

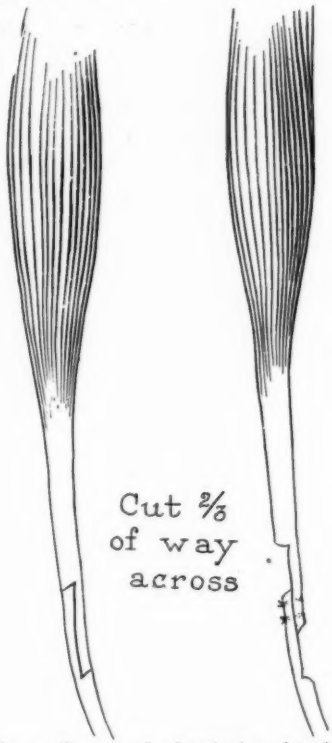

Fig. 1. Operation for lengthening of tendon.

Tenotomy.—Subcutaneous tenotomy is gradually giving way to the open type. The tendon Achilles is the best example and is lengthened by making two transverse incisions two-thirds across the tendon at different levels, and applying force so that the tendon ends will glide on each other and not gap (Fig. 1).

Stripping.—In certain situations a deformity is best corrected by stripping the muscle from the bone. Outstanding examples of this are the stripping of the os calcis in case of pes cavus deformity, and stripping the tensor fascia femoris from the iliac crest. The stripping of the os calcis, however, is not as successful in the markedly hollow foot, as might be expected. Usually bone must be removed in conjunction with it. Flexion deformity at the thigh is very often a serious handicap and a patient with severe deformity cannot stand erect enough to walk. The stripping operation in this region lengthens the affected muscles by transferring their origin to a lower level on the ilium; the operation in no way interferes with the nerve or blood supply of the muscle and thus the action is retained. Cutting directly across the muscle is prone to weaken it. In severe cases it may be necessary to dissect deeply onto the anterior portion of the capsule of the hip joint, cut this, and, in rare cases, divide the ilio-psoas muscle. The operations advised by Soutter and Campbell are identical in principle, but differ in that Campbell moves the muscle from its original bed along with a strip of bone to a lower level on the ilium, which is freshened so that the muscle will ankylose to it. He also cuts off the anterior superior spine with its attached muscle and moves it down (Fig. 2). The deformity may be of such degree

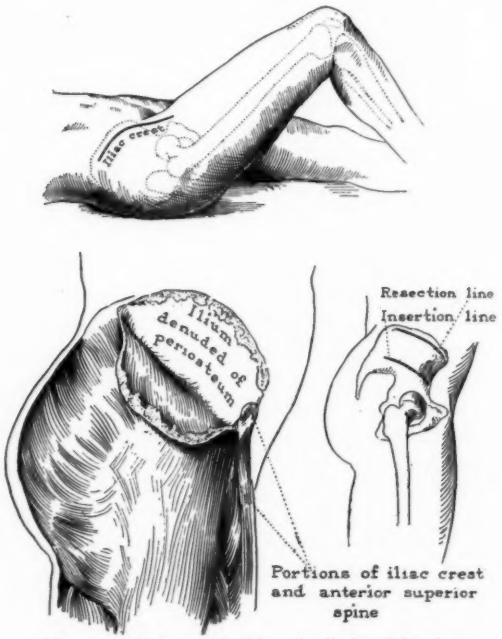

Fig. 2. Stripping of the ilium for flexion deformity.

that it can only be relieved by the removal of bone. This is true in long-standing talipes equino varus, and sufficient bone must be removed to permit of the correction of the deformity. There is not the necessity for removing as much bone as in cases of congenital talipes equino varus, for there is not the same tendency to recurrence in the acquired deformities.

Procedures to increase function.—Certain procedures are intended primarily to increase func-

tion, in those cases with no deformity, either by transferring tendons of non-paralyzed muscles to the insertion of paralyzed muscles, or by stabilizing procedures, the outstanding examples of which are the various operations on the foot and ankle. They are employed in suitable cases in which no deformity exists, or are used either at the same time as the procedures mentioned, or later, after the most has been gained by the altered and improved mechanics.

Tendon transference.—This operation is comparatively new in surgery, but we are now in a position properly to evaluate the method, for an enormous number of tendon transplantations and transferences have been done. The indications have become greatly narrowed, but this has raised the standard of the method until it is now used with greater confidence than in the early days. Steindler has done much to put the proper value on tendon work.

The strength of a muscle to be transferred should nearly approach that of the muscle which it is to substitute. This is all the more important when it is recognized that the altered mechanics consequent to the change of insertion often causes a loss of 50 per cent in the power of the muscle. All deformities should be corrected first, as the transferred tendon cannot be expected to correct a deformity. The tendon should be transferred under the proper tension and anchored in a proper manner. Much has been written recently on the technic of tendon transference. While this is important, it is not so important as whether or not the tendon to be transferred is strong enough to really help in the actual function. An example of tendon transplantation of the foot is the transference of the tibialis anticus to the outer side of the foot to replace the peroneus longus, or the transference of the peroneus longus to replace a paralyzed tibialis anticus. In the flail knee or in the knee with a tendency to buckle, if the hamstrings are good they can be swung forward, the biceps on the outer side and the semimenbranosus on the inner side, to the patella, thus taking at least part of the function of the quadriceps.

Stabilizing operations and arthrodesis.—Such operations may be undertaken on any of the joints. Under certain conditions arthrodesis may be performed on the hip or knee joint, but a patient will rarely elect this procedure, as most of them prefer to wear a brace unless their occupation is such that prolonged standing is necessary. Arthrodesis or stabilizing methods are replacing many of the tendon plastic operations on the foot. One of the chief operations, of the stabilizing type, is the Whitman astragalectomy, which consists of the removal of the astragalus along with posterior displacement of the foot. In suitable cases, particularly the calcaneal deformities, this gives an excellent foot with motion at the ankle and stability.

Instability of the foot is very disabling and the various arthrodesis operations such as those advised by Ryerson, Hoke, Steindler, and others, have a distinct advantage. The purpose of these operations is physiologic, namely, the restoration of stability. Such procedures also dispose definitely of existing and developing deformities and are examples of the combined types of operations mentioned. The physiologic function of any joint is stability and mobility. If stability is lost and mobility is retained, the joint, if a weight-bearing one, may be practically useless, but, on the other hand, if stability in good position is retained and mobility is lost, the joint may be extremely useful. In the foot the so-called triple arthrodesis, whereby an arthrodesis of the astragalus to the calcaneum, the calcaneum to the cuboid, and the astragalus to the scaphoid joint is obtained, will give real stability to the foot. In the shoulder when the deltoid is paralyzed marked disability follows the loss of power for abduction. The supraspinatus is not strong enough to abduct and the transference of the trapezius has not been successful. If the trapezius is powerful, excellent function is obtained by arthodesis of the head of the humerus to the glenoid fossa at an angle of 75° or 80° abduction, and forward about 70°. The mobility of the scapula on the trunk permits of a degree of motion for the whole arm that is greatly appreciated by those who have been deprived of the abducting power. The scolioses that rapidly become of the structural type following infantile paralysis have been especially difficult to treat and the results most unsatisfactory. Hibbs and his associates advocate securing the maximal correction by conservative measures followed by a fusion of the spinous processes and the laminæ thus maintaining the correction gained.

Bone block or check operations.—A block of bone may be placed in a situation so that a deformity may be prevented and the foot be kept in better position for function. Campbell's operation is a good example; a block of bone is placed

on top of the os calcis just posterior to the astragalus so that when the foot is dropped it will check against the tibia and thus prevent foot-drop (Fig. 3). The suspension method advocated by Gallie for foot-drop, wherein the paralyzed tendons of the tibialis anticus and peroneus longus are cut off and fastened to the tibia, has certain advantages, but the technical requirements of the operation are not as easily fulfilled as in the bone checking operations.

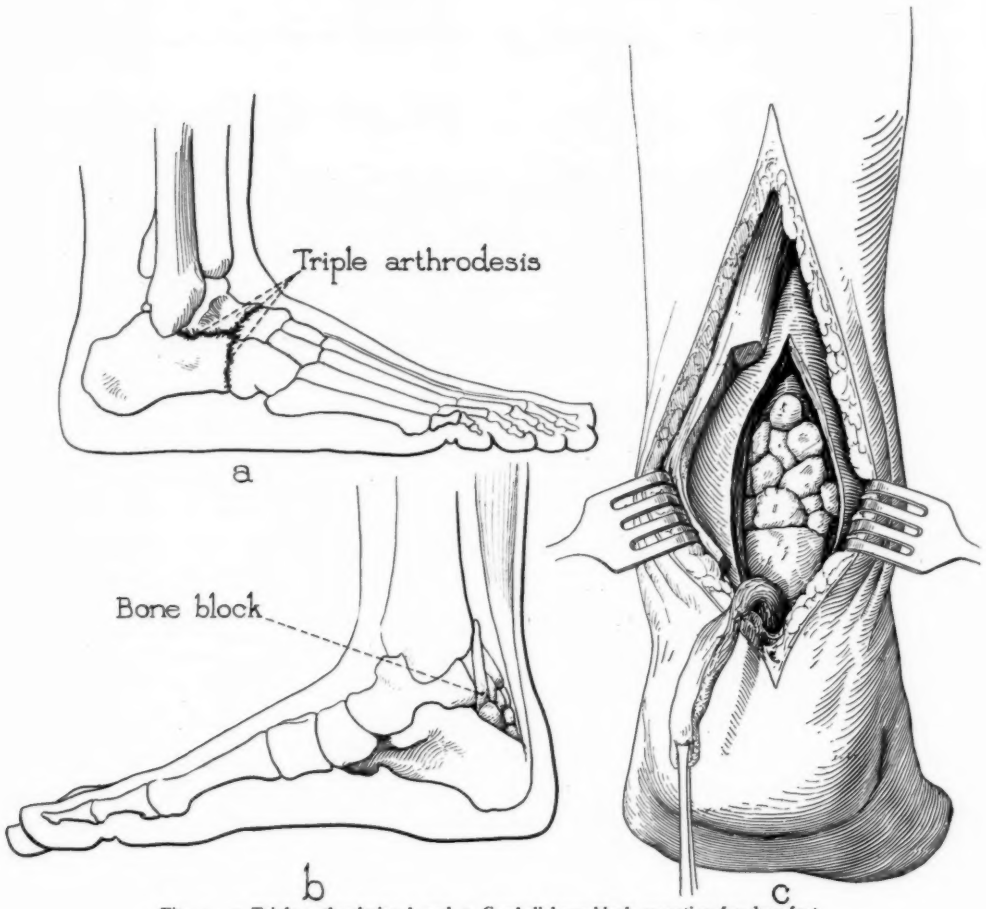

Fig. 3. *a*, Triple arthrodesis; *b* and *c*, Cambell bone block operation for drop-foot.

CONCLUSIONS

1. Each case of infantile paralysis demands careful consideration, for the operative methods are applicable to only a comparatively few of the total number of cases. The operation must be suitable for the patient and the disability, and the time for the operation must be carefully considered. The surgeon should be certain that all possible improvement has been obtained by conservative measures.

2. The operations are of two types: (1) those performed primarily to correct deformities, such as manipulation, tenotomy, and stripping operations; and (2) operations to improve function, the deformity having been corrected, such as tendon transference, stabilization, or arthrodesis. Combinations of the two types are exemplified in arthrodesis and the stabilizing types of operations.

3. Many operative procedures have been devised and applied to many patients, but most of these operations have been discarded. Many

times multiple operations are necessary to bring about satisfactory improvement.

BIBLIOGRAPHY

1. Campbell, W. C.: Transference of the crest of the ilium for flexion contracture of the hip. South. Med. Jour., 1923, xvi, 289-292.
2. Campbell, W. C.: An operation for the correction of "drop-foot." Jour. Bone and Joint Surg., 1923, xxi, 815-825.
3. Hoke, Michael: An operation for stabilizing paralytic feet. Am. Jour. Orthop. Surg., 1921, xix, 494-507.
4. Lovett, R. W.: The operative treatment of infantile paralysis. Surg., Gynec. and Obst., 1921, xxxii, 20-30.
5. Ryerson, E. W.: Arthrodesing operations on the feet. Jour. Bone and Joint Surg., 1923, xxi, 453-471.
6. Soutter, R.: A new operation for hip contractures in poliomyelitis. Boston Med. and Surg. Jour., 1914, clxx, 380-381.
7. Steindler, Arthur: Operative treatment of pes cavus; stripping of the os calcis. Surg., Gynec. and Obst., 1917, xxiv, 612-615.
8. Steindler, Arthur: The treatment of the flail ankle; pan-astragaloid arthrodesis. Jour. Bone and Joint Surg., 1923, xxi, 284-294.
9. Whitman, A.: Astragalectomy and backward displacement of the foot; an investigation of its practical results. Jour. Bone and Joint Surg., 1922, xx, 266-278.

UNIVERSAL BAN ON HEROIN

The Interparliamentary Union will be called on at its meeting in 1927 to determine whether a universal ban shall or shall not be placed on diacetylmorphine (heroin), if a resolution adopted at a recent conference in Geneva is effective. The resolution was adopted on the initiative of Stephen G. Porter, chairman of the Committee on Foreign Affairs of the U. S. House of Representatives, one of the U. S. delegates to the conference. Mr. Porter cited the action of the House of Delegates of the A. M. A., in 1920, recommending that heroin be eliminated from all medicinal preparations and that its manufacture and sale in the U. S. be prohibited. Mr. Porter is convinced that at least one third, or one-half, of the crimes of violence committed in the large cities of the U. S. by the so-called gunmen and others are committed by heroin addicts. (Jour. A. M. A., Sept. 18, 1926, p. 944.)

THE STANDARDIZATION OF INSULIN

Several international conferences in relation to the standardization of insulin have been convened by the health organization of the League of Nations. At the last conference approved methods of bio-assay for insulin were adopted, and the unit as provisionally defined by the Insulin Committee of the University of Toronto was accepted. (Jour. A. M. A., Sept. 25, 1926, p. 1040.)

MECHANICAL TREATMENT OF ANTERIOR POLIOMYELITIS*

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The treatment of anterior poliomyelitis easily divides itself into three distinct stages: (1) the acute stage, from the time of onset until the neuritis and myositis disappear (the time may be days or months); (2) the improving stage, beginning when neuritis and myositis have disappeared and remaining at least two years; (3) the surgical stage, beginning at least two years after the acute attack.

The mechanical treatment is not confined entirely to any one stage of treatment of poliomyelitis, as mechanical apparatus is used in the acute stage, the improving stage and the surgical stage. This paper has as its object a brief description of the types of treatment used, especially in the improving stage, which includes the use of apparatus, physiotherapy, extra warmth, exercises, etc.

We are quite universally agreed upon general measures of rest, extra warmth, light feeding and general symptomatic treatment in the acute stage. Spinal drainage has proved most valuable and, according to some authors, serum is of certain value.

The pathology of the condition is a hemorrhagic myelitis of the cord and inflammatory changes of the meninges and resulting edema in the cord and its coverings. This is the broad working basis and the treatment in the acute stage must be based upon the pathology.[1]

In the acute stage, after the fever has subsided, we usually find our patient paralyzed in one or more limbs, which are usually tender to touch, painful upon motion and the patient's general condition somewhat below par. It is our opinion that the principle of treatment should be rest and protection until all signs of tenderness upon pressure or motion have disappeared. Various types of apparatus are used in the acute stage, such as splints, fracture-box, sandbags, braces, plaster dressings, with the object of giving rest and preventing motion and deformity. Extra warm clothing, external heat, cotton or wool pads are aids in protecting the limbs and giving comfort. Absolute rest in bed should be

*Read before the Minnesota State Medical Association, Saint Paul, May 17-19, 1926.

the rule with the feet at right angles, the legs straight, upper extremities at rest and the patient flat in bed until motion and light massage are no longer painful. This may be only a few days in some cases; in others, many months.

At the end of the acute stage, that is when tenderness and painful motion have disappeared, a full and complete test should be made, of damage done, a complete muscle test should be given and the amount of damage to each muscle or group of muscles ascertained and a record kept. The method of Lovett[2] is most valuable. This includes examination of every available muscle group of arms, legs, back, neck and abdomen. The degree of existing power in the muscles is classified as follows: (1) normal; (2) good, when the muscle performs full function and takes some resistance; (3) fair, when the whole arc of motion is performed but very little resistance is required to overcome the movement; (4) poor, when there is some motion but when complete motion cannot be accomplished against gravity; (5) trace, when there is muscular contraction but no motion in response to voluntary effort; (6) gone, when there is no response in the muscle to voluntary contraction. A record should be kept of the various groups of muscles and tests should be taken at least twice each year for record as to improvement.

If average mechanical judgment has been used the patient will reach the convalescent improving stage without deformity. If deformity is present when the improving stage is reached, it should be corrected gently and suitable apparatus advised. If the paralysis has damaged only a few or small group of muscles, the patient may be up and about with apparatus; if the paralysis involves many groups of muscles, weight bearing, I feel, should be denied for a longer period and the very best results in our experience have come to the patient who has remained in bed at least a year after the acute stage. Some may be able to take exercises without weight bearing in swimming tanks or on horseback. The general condition of the child should not be overlooked in the improving stage because many are anemic, badly nourished and are in a poor way to undergo even simple types of treatment used in the improving stage.

Apparatus.—The treatment of the improving stage includes the use of apparatus (bracing and walking apparatus). The object of the apparatus is to give stability to the extremities and the spine so that the patient may walk and move about. Braces also prevent deformity and muscle strain, help the patient to exercise the strong and well muscles and aid in improving circulation, muscle tone and the return of the limbs to normal. Sleeping apparatus is used to keep the feet at right angles, the knees in normal position, keep the spine straight and, also, the upper extremities in proper position and is as necessary as the walking apparatus used in the daytime. It is desirable that the apparatus should be (1) simple, (2) easily applied and accomplish the results required, (3) comfortable, light of weight and if possible of good appearance.

Apparatus should be ordered by the physician and applied by him rather than by the instrument maker, who has little knowledge of the existing disability and the real requirements of the apparatus. Many instrument makers are willing to coöperate to the good of the patient and their advice often results in a simpler and better type of apparatus.

Muscle training.—Muscle training consists in performing certain motions with the muscles and parts affected, asking the patient to use all the muscle power he has in performing and aiding this motion. If many groups of muscles are affected, the assistance of one trained in a special field of physiotherapy is quite necessary. If only a group or two of muscles are involved, the mother or nurse properly instructed may carry on with fair success. The exercise should be only a few manipulations repeated several times daily if possible. Long-continued and infrequent exercise is perhaps more harmful than none at all. A muscle receives its nerve supply through more than one spinal center and it is the object of muscle training to exercise the damaged nerve centers and tracks as well as the muscles. It is quite apparent that muscle training is of no value when there is complete loss of nerve enervation.

Massage.—Massage undoubtedly increases the blood and lymph supply, carries heat to the tissues, improves muscle tone and may assist in the prevention of deformity. If many groups of muscles are involved, one specially trained in massage is necessary to give proper treatment. Again, the nurse or mother can be of great aid in the simple case, remembering that massage should not be prolonged but should be of short

duration and given frequently. It is my opnion that massage gives greatest benefit by aiding circulation, improving the muscle tone and improving the temperature of the affected part. Long-continued massage is harmful and the effect of massage in the cure of a case has been, I believe, grossly exaggerated.

Extra warmth.—In the improving stage we find the temperature of the limb much below normal. Extra clothing, wool clothing, hot baths, radiant heat through electric lamps are of great importance in keeping up muscle tone and preventing atrophy and damage to the parts in cold weather.

The ideal case should spend many months in bed receiving extra warmth, massage and graduated exercises through muscle training until muscle strength is sufficient to permit weight bearing. In the improving stage exercises without weight bearing are of great value. Swimming in brine tanks or even exercises taken in the common bathtub without weight bearing are of great value. Horseback riding, moving about in apparatus or exercises obtained without weight bearing are of great value.

Electricity.—Electricity, perhaps, if properly given by one trained in localizing the nodal points of the muscles affected, may be of some value. It is our opinion that the value of electricity is similar to exercise, producing contractions in muscles not possible to exercise by other means. There is much apparatus on the market at the present day but in our own practice we seldom use electricity. I believe it has been overrated and damage is actually done by its long continued use or when employed in untrained hands.

End-results.—If apparatus, muscle training, rest, massage, extra warmth have been conscientiously used, we can expect, I believe, certain definite results expressed approximately in the following percentages:

PERCENTAGE OF GAIN IN THREE YEARS[2]

	Full Recovery	Partial Recovery	No Recovery
Upper extremities:			
Arm			
Wrist extensors	68%	12%	20%
Wrist flexors	63%	9%	28%
Trapezius	61%	22%	17%
Pectoralis major	59%	21%	20%
Biceps	59%	25%	16%
Triceps	59%	20%	21%
Posterior deltoid	56%	22%	22%
Anterior deltoid	53%	29%	18%
Trunk			
Abdomen	30%	19%	51%
Back	78%	17%	5%
Neck	90%	8%	2%
Lower extremities:			
Leg			
Gluteus maximus	34%	26%	40%
Peroneals	32%	28%	40%
Hip flexors	30%	33%	37%
Hamstrings	24%	49%	27%
Gastrocnemius	22%	40%	38%
Hip abductors	21%	34%	45%
Quadriceps	21%	42%	37%
Posterior tibials	14%	28%	58%
Anterior tibials	12%	36%	52%

REFERENCES

1. Chatterton, C. C.: Mechanical and surgical treatment of talipes due to anterior poliomyelitis. St. Paul Med. Jour., 18, 304-307, Oct., 1916.
2. Lovett, R.: The third year in infantile paralysis. Jour. Am. Med. Assn., 77, 1941, 1921.

EPHEDRINE

The Council on Pharmacy and Chemistry publishes a report on ephedrine. Ephedrine is an alkaloid first obtained in 1887. Chemically, it is closely related to epinephrine. Ephedrine hydrochloride and ephedrine sulphate are soluble in water. Ephedrine is claimed to produce effects similar to epinephrine. Its most important effects thus far reported consist in a rather lasting rise of blood pressure on intravenous or intramuscular injection. Clinically, promising results have been reported from the use of ephedrine, especially in asthma and for shrinking the turbinated bodies. The clinical trials which have been reported in this country have been carried out with ephedrine sulphate made in the Peking Union Medical College. The Council is informed that the Abbott Laboratories will shortly be in a position to supply a salt of ephedrine obtained from this source. Burroughs, Wellcome & Co., London, supply ephedrine hydrochloride for experimental purposes and have supplied the Council with a specimen of the product and the tests and standards used for its control. Eli Lilly & Co. has announced that it is marketing ephedrine sulphate, containing a small amount of pseudo-ephedrine, under the name "Fedrin." The Council is considering the question of recognizing the proprietary name for this product, and the evidence for its value and control. The A. M. A. Chemical Laboratory has taken up the establishment of standards for ephedrine hydrochloride and ephedrine sulphate. The Council has postponed the acceptance of ephedrine or its salts for New and Non-official Remedies to await confirmatory clinical evidence, and until acceptable brands of the drug are available. (Jour. A. M. A., Sept. 11, 1926, p. 849.)

CARDIOVASCULAR RENAL DISEASE IN RELATION TO SURGERY*

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The safety of surgical procedures is largely dependent on the cardiovascular-renal reserve. Age, sex, stature, state of nutrition, and occupation, are vital factors which exert a profound influence on the amount of reserve in the circulatory system and renal excretory structure. Youth possesses a more resilient circulatory system than age and consequently a greater cardiovascular reserve. While the sex incidence of organic cardiac disease is approximately equal, the life expectancy of women with cardiac disease is greater than that of men, for women, as a group, are subject to lesser occupational stress, and are not called on to deplete so rapidly their cardiac reserve. Patients whose daily occupational routine subjects them to strenuous physical strain and stress, have a life expectancy which is not comparable, as a rule, to that of patients with lighter duties to perform.

Clinical observation has contributed much to the knowledge of cardiovascular renal disease. However, not until recent years, through the epoch-making advances in the medical sciences, have means and methods been available for estimating the efficiency of the circulatory system and renal excretory mechanism, and for measuring to a fair degree the cardiovascular renal reserve. The phenolsulphonephthalein test of Rowntree and Geraghty, the first trustworthy method of estimating renal function, has withstood the test of time and repeated application, as has the estimation of the urea and creatinin content of the blood. These methods are invaluable not only in the estimation of renal function, but in affording a means of relative prognosis so far as renal excretory function is concerned.

In recent years electrographic studies have enlarged our knowledge of the effect of cardiovascular disease on the efficiency of the circulatory system, and have also afforded a means of relative prognosis. It is not to be inferred that these methods supplant clinical study and observation, but rather that they enhance the value of such observations when used in conjunction with them. Together they increase the degree of certainty with which one may foretell the additional burden that these vital organs may withstand.

The relation of cardiovascular renal disease to surgery is constantly changing, not only as a result of advances in the medical sciences, but through improvement and refinement of surgical methods fostered by the desire to improve results and decrease the mortality rate. It was only through the acceptance and application of the principles and teachings of Lister that intra-abdominal, intra-thoracic, and intra-cranial surgery became possible and has progressed. Lister presented the first important factor of safety in the conduct of surgical procedures, and surgery has progressed, results have improved and the mortality rate has been reduced as the result of refinements of methods, better selection of patients, and the introduction of additional factors of safety.

In the past, in a fair proportion of the cases that comprise surgical mortality, death has been due to cardiovascular renal disease; and experience has taught that, barring the circulatory lethal accidents of coronary sclerosis and thrombosis and pulmonary embolism, death is often preventable when the surgical procedures are conducted within the circulatory and renal reserve.

Causes of death following surgical procedures may be divided into three groups: (1) preëxisting and coëxisting organic disease; (2) surgical accidents, and (3) infection. For the most part, Group 1 comprises renal insufficiency and cardiovascular disease. The most common causes of death in Group 2 are, hemorrhage, shock, and effects of anesthetics. Group 3 contains a wide range of infections, many of which are most prone to occur in debilitated patients, particularly when the cardiovascular renal reserve is depleted by extensive surgical procedures; most of them may be eliminated, however, by directing attention to the causes of death in Groups 1 and 2. Prolonged surgical procedures and long general anesthesia rapidly deplete even normal cardiovascular reserve. The depressant effect of general anesthetics, particularly ether, on the kidney, has long been recognized and has given way largely to the use of local and regional anesthesia for operations in the presence of renal disease. That prolonged general anesthesia increases the stress upon the

*From the Division of Surgery, Mayo Clinic, Rochester, Minnesota. Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 17 to 19, 1926.

cardiovascular system is beyond question. Lundy has recently shown by experimental and clinical investigation the immediate deleterious effect upon the circulatory system of prolonged and repeated cyanosis during anesthesia, and concludes that the cardiac reserve is rapidly jeopardized by it.

The divided or multiple-step operation is applicable to many surgical procedures and affords a means of minimizing the burden of surgical treatment in the presence of low cardiovascular renal reserve.

Metabolic studies have clarified our knowledge of the effect of disturbance of internal glandular structures and have established the present-day methods of rehabilitation of surgical patients. Plummer's recent contribution regarding the administration of Lugol's solution to patients with exophthalmic goiter has practically eliminated disturbances of the cardiovascular system as a cause of death following thyroidectomy.

The discovery of insulin and its use in the treatment of diabetes has eliminated the effect of diabetes on mortality rate. Rowntree and Keith have shown that the average patient with nephritis may be operated on with safety after adequate preparation, the application of surgical factors of safety, the use of local, regional, or combined anesthesia, and with the divided or step operation.

Perhaps no group of patients presents the problem of cardiovascular renal disease in relation to surgery so vividly as those suffering from prostatic obstruction. Ninety-five per cent of these patients are more than fifty years of age; 75 per cent are between sixty and seventy-five years of age. Prostatic hypertrophy occurs at an age later in life than the usual surgical diseases, and the degenerative changes in the cardiovascular system incident to that age require consideration.

Willius, in a recent study from the cardiovascular standpoint, including electrocardiographic investigation of 705 patients with prostatic hypertrophy, noted the presence of cardiovascular disease in 42 per cent. Arteriosclerotic cardiac disease occurred most frequently. Forty-three per cent presented this type, and 36 per cent the arteriosclerotic type associated with hypertension. Hypertensive cardiac disease occurred in 17 per cent, unassociated with outstanding arteriosclerotic features. Miscellaneous types of cardiac disease occurred in 4 per cent of the cases and included rheumatic endocarditis, with stenosis or incompetence of the mitral or aortic valves, myocarditis, and pericarditis. In 8 per cent of the cases angina pectoris was present. Willius further concludes that the incidence of cardiovascular disease is higher with prostatic obstruction than with many other diseases during similar decades, indicating that coëxisting cardiovascular disease is increased by persistent urinary retention.

In a recent review I noted that in 75 per cent of patients with surgical benign prostatic obstruction the residual urine varied from 60 c.c. to the capacity of the bladder, and that the resultant renal insufficiency varied from slight retention to over 200 mg. of urea for each 100 c.c. of blood, when uremia was present at the time of admission. The improvement of the cardiovascular reserve coincident with improvement of renal function following gradual decompression of the bladder and prolonged urethral or suprapubic drainage is noteworthy in conjunction with Willius' observation of the incidence of cardiac disease in cases of prostatic hypertrophy. I have observed numerous patients of this type, in uremic states and near a cardiac break, return to a fair state of cardiovascular renal reserve so that they have been operated on safely and successfully. During 1925 at the Mayo Clinic prostatectomy was performed in 255 cases with only six deaths, a mortality rate of 2.3 per cent. In only one was death due to cardiac disease.

So far as the heart is concerned, our experience leads me to state that the ordinary valvular lesions that are fully compensated present no unusual surgical hazard. In the presence of the acute or subacute endocardial valvular infections. however, only most urgent surgical operations should be considered. Likewise, congenital lesions of the heart add a distinct hazard to major surgical procedures. The consideration of operation in the presence of the degenerative cardiac diseases must be individualized and based entirely on the prognosis of the particular type of disease, as ascertained by clinical and electrocardiographic studies, considered in conjunction with the urgency of the operation and the effect on the cardiovascular system of removal of the surgical burden. It should be emphasized that prostatic obstruction, large pelvic and abdominal tumors, and so forth, may act as a burden to the

circulatory system, and improvement follow immediately after operation.

Essential hypertension in the presence of good cardiac and renal function is no contraindication to surgical operations.

So far as renal disease is concerned, surgical procedures may be successfully carried out in the presence of marked renal damage. The renal functional tests may be utilized as excellent guides to the risk in the presence of renal insufficiency. It may be stated, however, that except under most unusual conditions operation should not be contemplated if the urea content of the blood is above 100 mg. for each 100 c.c., or the phenolsulphonephthalein return is less than 15 per cent.

At times patients are encountered in whom severe cardiovascular or renal complications occur postoperatively although there have been no preoperative manifestations of such organic disease. These, however, usually recover. Barrier and Keith have reported four cases of acute renal insufficiency following major operation. However, postoperative cardiovascular renal complications are usually acute exacerbations of previous coëxisting disease and usually abate.

The operability of patients with severe cardiovascular renal disease is not generally appreciated; nor is the scope of surgical treatment of such patients realized. When they are operated on under certain conditions the mortality rate may be surprisingly low. In many cases the chronic cardiovascular renal disease is determined by a fixed pathologic condition, and may be benefited only by the removal of coincident burdens, such as reduction of weight, removal of foci of infection, and adjustment of habits. On the other hand, it is often an acute exacerbation produced by surgical conditions amenable to operative treatment, without great hazard, if adequate preoperative preparation is instituted. It is essential that a patient suffering from severe cardiovascular or renal disease should receive careful preparation for surgical treatment. Such a patient is never suitable for routine surgical treatment; however, judicious preoperative preparation, followed by the divided or multiple-step operation under local or combined anesthesia, usually results in uneventful convalescence.

With no intention of minimizing the importance of cardiovascular renal disease, but fully aware of the potential hazards, I believe that present methods of determining cardiovascular and renal efficiency and determining reserve, together with the adequate methods of preoperative treatment, afford opportunity for surgical relief of many coëxisting and exacerbating conditions with a surprisingly low mortality rate, heretofore not appreciated.

WHAT PRICE FREE HOSPITALIZATION?

Minneapolis has a General Hospital for the resident needy of the City. Hennepin County has a tuberculosis sanitarium for the rest of its needy tuberculosis patients of the County. The State University likewise operates a hospital, accessible to all residents of the state who may be deemed entitled to treatment therein. Theoretically only those who by reason of the financial condition of themselves or family are unable to pay for private medical care and attendance, are to be admitted to these institutions. As far as the University General Hospital is concerned, however, and having special reference to the condition of affairs existing in Hennepin County, it seems that this theory is far from being recognized in actual practice.

Under a law passed in 1921 the several counties of the state could send needy patients to the State University Hospital upon certification of the Judge of Probate that the applicant was entitled to free treatment, expense of which is borne equally by the county and state. Under this act, for the fiscal year ending June 30, 1923, the cost to Hennepin County for its half was $459.97.

In 1923, however, the law was so amended as to give to the County Commissioners of each county, individually, the right of certifying applicants to this hospital. By a peculiar coincidence the change in the law was accompanied by a decided change in the financial condition of the residents of Hennepin County, for the first fiscal year wherein the certification was made by the County Commissioners of Hennepin County, ending June 30, 1924, the cost to the county for its half had jumped to $3,135.52; to $16,758.28 for the year ending June 30, 1925; and to $32,687.90 for the year ending June 30, 1926.

That this change in the law did not similarly affect the financial condition of the residents of other counties in the state is shown by the fact that Ramsey County's one-half for the fiscal year ending June 30, 1924, was only $556.37, for the fiscal year ending June 30, 1925, was only $356.03, and that for the fiscal year ending June 30, 1926, their one-half had dropped again to only $104.60.

In other words, where the one-half paid by the 86 counties of the state for the fiscal year ending June 30, 1926, amounted to $83,933.00, Hennepin County's share amounted to 38.9 per cent of that total, while Ramsey County's expense represented only 6/100 of 1 per cent of the cost to all counties.—*The Taxpayer*, Aug. 15, 1926.

THE CLINICAL APPLICATION OF THE NEWER KNOWLEDGE OF THE BILIARY FUNCTION*

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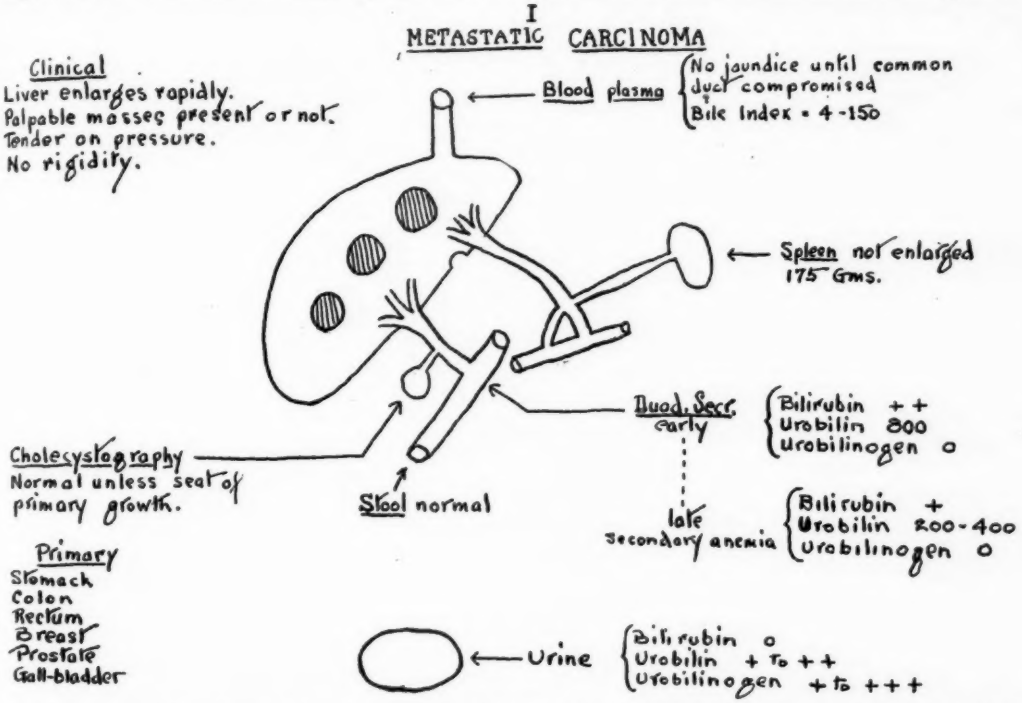
As early as 1914, while working with Eppinger, I convinced myself of the correctness of F. Mueller's theory as regards the fundamental importance of bilirubin excretion by the liver: that unless bilirubin is allowed to flow into the bowel where bacteria can reduce it at least in part into urobilin the urobilin will disappear from both the bile and urine and not reappear regardless of how badly damaged the liver becomes or how much blood is destroyed and thrown upon the liver by chemical agents.

Since then a great deal of contention for and against this hypothesis has been indulged in. Thanks to the work particularly of Rous and McMaster of the Rockefeller Institute and Mann of Rochester the hypothesis now can be regarded as converted into an established fact. The fact which misled many observers was that if the reducing organisms, normally present in the bowel only, ascended into the common duct and its hepatic radicles and then the common duct was tied or the excretion obtained by duodenal tube, urobilin would be formed. This state of affairs, as shown by McMaster, was the constant error in the common methods of animal bile fistula work. Rous' work with methods obviating this infection gave the first clarity to the experimental data.

A second fact which now can be regarded as established with reference to the relation of bilirubin and hemoglobin is that as Rous[1] says "under normal circumstances the variations in the

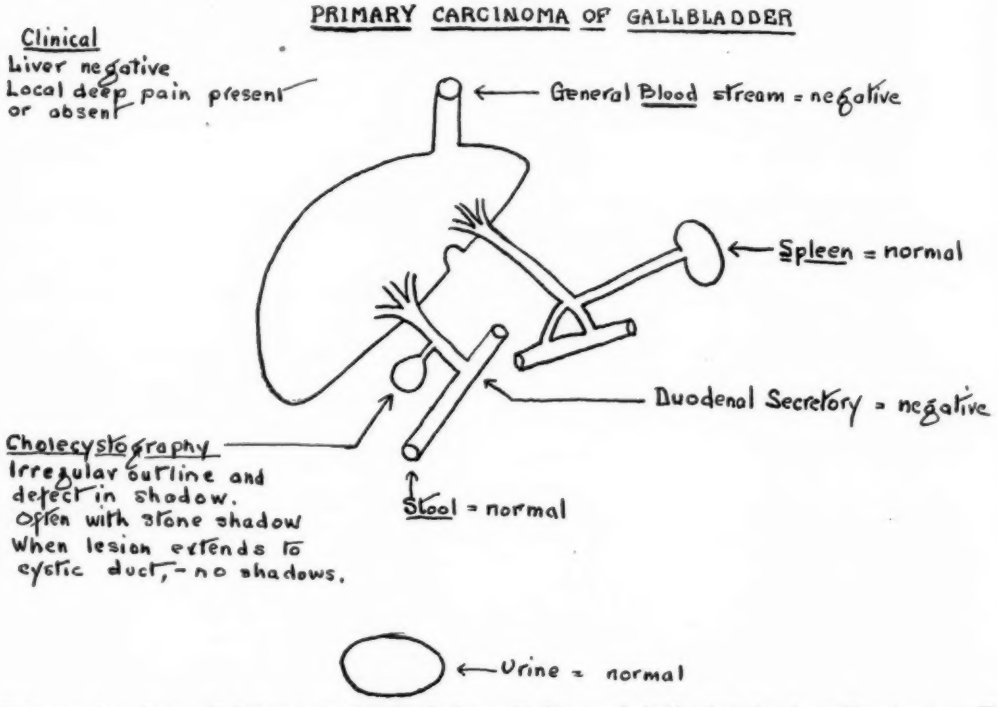


While metastatic carcinoma of the liver is by far the most common discrete lesion of the liver, the values indicated hold equally well for gumma, cyst ecchinoccic or congenital, sarcoma and simple tumors. Abscess of the liver unless well walled off will give because of the outspreading hepatitis much more functional disturbance and higher bilirubin values in the blood and urine. A stone or new growth obstructing any one of the main divisions of the hepatic duct causes complete atrophy of the tributary portion of the liver without producing symptoms and with only transitory urobilin in urine. The bile index is not permanently raised to fifty or over unless the growth is compromising the common duct at the hilus of the liver. Values of 150 occur only when there is complete common duct obstruction. Values of 50 to 100 occur when two-thirds or more of the liver is involved in the growth and the growth is progressing rapidly.

*From the Medical Division, Nicollet Clinic, Minneapolis. Read before the Interurban Academy of Medicine, Superior, Wisconsin, March, 1926, and The Minnesota Pathological Society, April, 1926.

amount of hemoglobin circulating as blood from day to day find a direct, if not entirely accurate, expression in the amount of bilirubin discharged into the bile. The corpuscular wastage would seem to be recovered almost immediately in terms of bilirubin, the greater the number of cell deaths the more the bilirubin put out." In 1916 I[2] postulated this fact from my blood and duodenal quantitative pigment studies. In 1917 I[3, 4] was sufficiently certain of my ground to venture to express this relation by a simple formula which I called the hemopoietic-hemolytic index or H-H for short. In 1920 I[5] found that I could produce increased bile pigments in healthy students by taking advantage of the hemolytic action of quinine salts. At that time I suggested to my former student and co-worker, Dr. Platou, that malaria could be diagnosed quite readily by direct pigment estimations as by finding the parasites in the blood. He had an excellent opportunity to make these observations and reported his work in an eastern journal.[6] It is gratifying to find in the course of ten years that the concept is now an accepted fact and can be built on without reservation. In 1920 Rous and Oliver's work was editorially commented on in the Journal of the American Medical Association in these sentences, "The diagnosis of disease like pernicious anemia and hemochromatosis has sometimes been extremely difficult unless a conspicuous siderosis of the skin has developed. Necropsy usually reveals far more siderosis in the internal organs, but it cannot be detected during life." I answered this by studies in seventeen patients dying of pernicious anemia in which detailed studies of the hemosiderosis in spleen, liver, pancreas and kidney were done in whom during life duodenal pigment studies predicated post-mortem findings. I said that icterus was a relatively late phenomena and that long before the sclera and skin registered the pigment the blood bed was flooded with bilirubin. In

II



Prior to the advent of cholecystography the finding at operation of an uncomplicated primary carcinoma of the gallbladder was purely accidental and fortuitous. The diagnosis was stone. With cholecystography it is possible to make a pre-operative diagnosis provided the cystic duct is free and no complicating cholecystitis is at the time of the examination making the gallbladder so irritable that the dye will not enter. The help in differential diagnosis is desirable, for many elderly patients with chronic cholecystitis, stone and pericholecystitis often with bulky adhesions are wrongfully so strongly suspected of having malignancy that they are only too frequently not given the benefit of operative interference.

1925 Rous now says: "Tissue icterus is in point of fact only the imperfect secondary expression of a condition primarily confined to the blood pool."

Thanks particularly to the work of Mann and his associates we are now prepared to believe that the conversion of hemoglobin into bilirubin occurs in the territory of the reticulo-endothelial system as a whole with the emphasis upon the marrow, spleen, lymph glands, and the Kupffer cell areas of the liver. The liver then as a whole, in relation to this function, is to be regarded as an excretory organ and not primarily a manufacturing one. This discovery immediately clarified a fact which mystified me for ten years, to-wit: why does the blood bed contain in the hemolytic diseases so much bilirubin and not urobilin? It does because the bilirubin is on its way to the liver and not on its way to the kidney as I had always supposed.

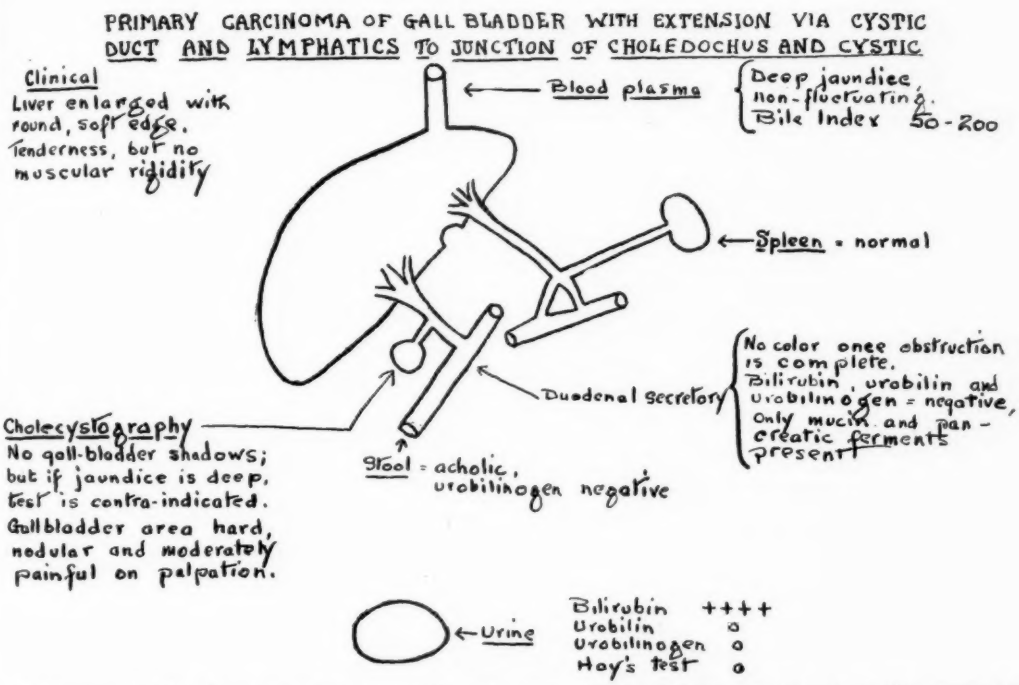
The establishment of the further fact that bilirubin, for the liver as well as the kidney, in man is a threshold substance and its threshold many times higher than urobilin, serves to make the mystery clear. Bilirubin cannot escape via the kidney for the dam there is higher than at the liver portal: urobilin does not accumulate in the blood pool because it can with ease slide out at the kidney door.

For ten years I have played with these pigments as they occur in the duodenal secretion, in the urine and blood plasma. With the advent of this newer knowledge it occurred to me that it might be profitable to consider liver function from the angle of this physiologic pigment—for at least then one is certain of what particular function of the liver he is attempting to evaluate.

To measure total liver function is quite another matter when we stop to enumerate for instance a few of its relatively well known functions to wit:

1. Stores glycogen.
2. Converts protein products absorbed from the bowel into urea.
3. Detoxifies poisons; fixes and renders harmless bacteria and foreign proteins.
4. Metabolizes bile salts.
5. Excretes cholesterol and calcium.

III


PRIMARY CARCINOMA OF GALL BLADDER WITH EXTENSION VIA CYSTIC DUCT AND LYMPHATICS TO JUNCTION OF CHOLEDOCHUS AND CYSTIC
Clinical
Liver enlarged with round, soft edge. Tenderness, but no muscular rigidity
Blood plasma
Deep jaundice, non-fluctuating. Bile Index 50-200
Spleen = normal
No color once obstruction is complete. Bilirubin, urobilin and urobilinogen = negative, only mucin and pancreatic ferments present
Duodenal secretory
Cholecystography
No gall-bladder shadows; but if jaundice is deep, test is contra-indicated. Gallbladder area hard, nodular and moderately painful on palpation.
Stool = acholic, urobilinogen negative
Urine
Bilirubin ++++
Urobilin 0
Urobilinogen 0
Hoy's test 0

Carcinoma invading the juncture of the cystic and common duct is usually attended with a painless deep non-fluctuating jaundice. A stone in the common duct may also be painless but off and on bile escapes by the stone, which is the most important differential diagnostic point.

6. Excretes bile pigments, after partaking in their metabolism.

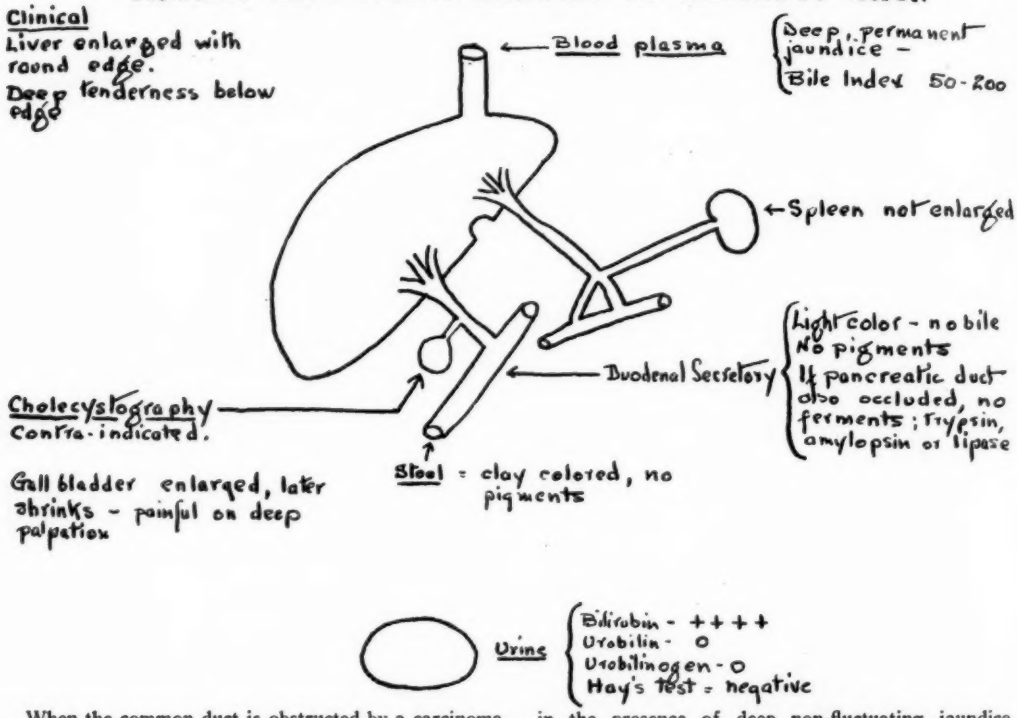
1. The sugar storage and release function of the liver involves too many other organs and tissues to be promising as a liver function test. The liver regulates the content of glucose in the blood, but the pancreas and other tissues have to do with its utilization. Mann has shown that the body can utilize levulose without the presence of the liver. I therefore mention the levulose and fructose liver function tests to dismiss them.

understanding appearing, but as yet not many fixed facts.

4. The bile salts (sodium taurocolate and soda glycolate) are specifically synthesized in the liver and are the pace-makers of the bile-secreting function of the liver. That much is established. When they are withdrawn to the outside as in bile-fistula work the total bile secretion of the liver drops often to one-third. In duodenal bile studies the bile acids can be tested for, qualitatively, but there has appeared no reliable quantitative method.

IV

PRIMARY CARCINOMA OF PANCREAS OR PAPILLA OF VATER



When the common duct is obstructed by a carcinoma, Courvoisier tells us that the gallbladder will enlarge. Since in new growth at the papilla of Vater or primary in the pancreas there is not necessarily an antecedent chronic cholecystitis, it is to be expected that in the vast majority this enlargement will take place; so that in the presence of deep non-fluctuating jaundice a palpable gallbladder is strong evidence for malignancy. In stone at this site, commonly there are chills and fever, which symptoms are not common in new growth. The pain in new growth, if present at all, is lasting and deep in the abdomen; in stone, during periods of migration colic.

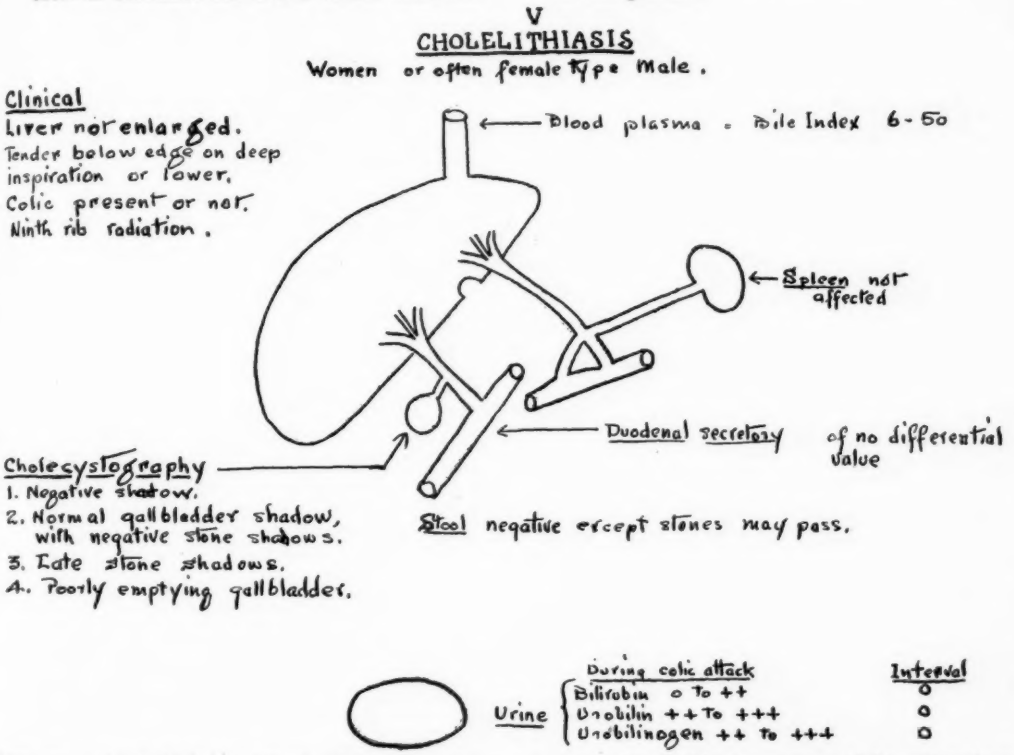
2. Of the part played in urea production by the liver we lack sufficient knowledge at various points in the cycle to feel other than that again here other organs and tissues play a not inconsiderable part.
3. The detoxifying function of the liver is being very intensively studied at present and in the field alone of immunity there is much

McClure[7] uses a colorimetric test not as yet accepted by other workers.

5. Cholesterol has a very enticing rôle, both in the blood, the bile secretion, and in the gallbladder itself, as shown by Boyd.[8] McMaster has shown that the output and concentration of this difficultly soluble substance in the bile are profoundly modified

by dietary influences. A diet rich in fats with their high lipoid content undoubtedly leads to cholesterosis of the gallbladder and hypercholesteremia. The latter condition obtains, as we have known for a long time, in the puerperium and is unquestionably related to the high ratio of cholelithiasis in women who have had multiple pregnancies, the cholesterol here being derived from the involuting uterine muscle. When a few more fixed facts are established we can proceed to correlate the blood values with the duodenal values and the gallbladder rôle and probably solve a very large class of so-called strawberry gallbladders. The duodenal colorimetric test as yet is a doubtful one.

6. Jaundice is fathered by the blood and born of the liver; the liver in so far as the biliary function is concerned is an excretory organ and our knowledge, while greater than that of the foregoing functions mentioned, would be vastly greater than it is, were that excretion to the outside as is the urine. Up to the present there is no acceptable artificial liver function test. The phenoltetrachlorphthalein test has probably been most thoroughly tried and the best that can be said for it is that it will show a parallel retention to that of bilirubin in the blood stream, and the worst, that it is not without danger to the patient.



The liver threshold for urobilin is relatively very low compared with bilirubin. In mild parenchymatous swelling or passive congestion or toxic reaction or transient lymphangitis of the radicles of the gallbladder tubules and parenchyma, urobilin will overflow into the blood stream and, since the renal threshold has the same relative status, will appear early in the urine and disappear late. The bilirubin, on the other hand, is late to appear (blood bilirubin must be high) and early to disappear because of the high threshold at the kidney door. Hence it is unusual for the index to be above ten in an uncomplicated gallstone attack, while urobilin will be present in large quantities in the urine. For bile index values of 100 or over a complete inflammatory or stone closure of the common duct must supervene for at least twenty-four hours.

Berger[9] et al., in parallel function tests, summarize in the following table the positive and negative results in their *control* cases. This table and their remarks as regards their evaluation, to-wit:

1. That none of these tests are specific for liver dysfunction.
2. That these tests are specific but many per-

sons have latent liver damage or liver dysfunctions that are transient and are undetectable by ordinary means—

is sufficient commentary. Specifically to be noted is the fact that of the five tests the urobilin test alone accords with the clinical facts.

TABLE VI*

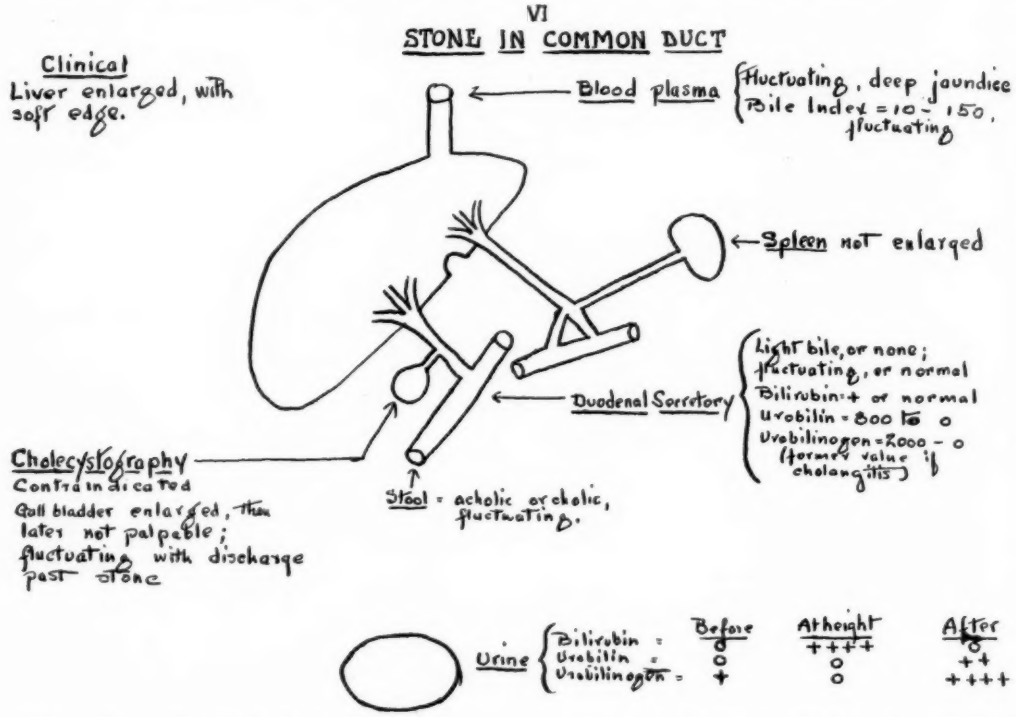
Vonderbergh		*Widal*		*Dye*		*Urobilin*		*Bile Salts*	
Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
421	57.9	39.4	60.6	10.5	89.5	5.5	94.5	23.6	76.4

These are results of tests in cases with clinical conditions in which liver disease was unsuspected; namely *controls,* and embrace thirty-eight observations.

We will proceed, then, to a study of the excretory function of the liver judged by the play of biliary pigments and their pathological derivatives; their behavior in health and disease. I believe it offers by far the most reliable and fruitful field in clinical worth.

For a basic understanding it is necessary to know what the normal pigment output as it issues from the duct is; what the normal blood pigment level is; what the threshold in the liver for bilirubin and urobilin is; what the kidney threshold for both is; and what variations are produced by the daily routine, food, drink, exercise, bowel habit, etc.; and last but not least what variations are produced by menstruation and pregnancy and the puerperium.

VI


STONE IN COMMON DUCT
Clinical
Liver enlarged, with soft edge.
Blood plasma
Fluctuating, deep jaundice
Bile Index = 10 - 150, fluctuating
Spleen not enlarged
Duodenal Secretory
Light bile, or none; fluctuating, or normal
Bilirubin: + or normal
Urobilin = 800 to 0
Urobilinogen = 2000 - 0 (former value if cholangitis)
Cholecystography
Contraindicated
Gall bladder enlarged, then later not palpable; fluctuating with discharge past stone
Stool = acholic or cholic, fluctuating.
Urine
Bilirubin = Before 0 Atheight ++++ After ++
Urobilin = 0 0
Urobilinogen = + 0 +++

While colic usually attends the migration of a common duct stone, pain may be totally absent. Then, particularly in an elderly person, carcinoma is favored. A daily bile index with a daily qualitative urobilin test will in the presence of stone give fluctuating values, and so long as urobilin is present in the urine it can safely be said that there is no complete obstruction except where infection is added to the picture. If infection in the duct (usually chills and fever) is present, then urobilin will be present in the urine even though there is complete common duct obstruction below this point. So-called clay stools may be misleading unless tested for urobilin, since the patient may be on a milk diet, etc., productive of a very light stool.

Bile is being excreted by the liver continuously, day and night, and even in man, during long fasts of fifteen to thirty days, bile appears steadily in the duodenum. The liver flow is a steady stream —the gallbladder occasions the tides. I convinced myself of this while working with healthy student material in 1920. Carlson has recently emphasized this strongly. The daily quantity in

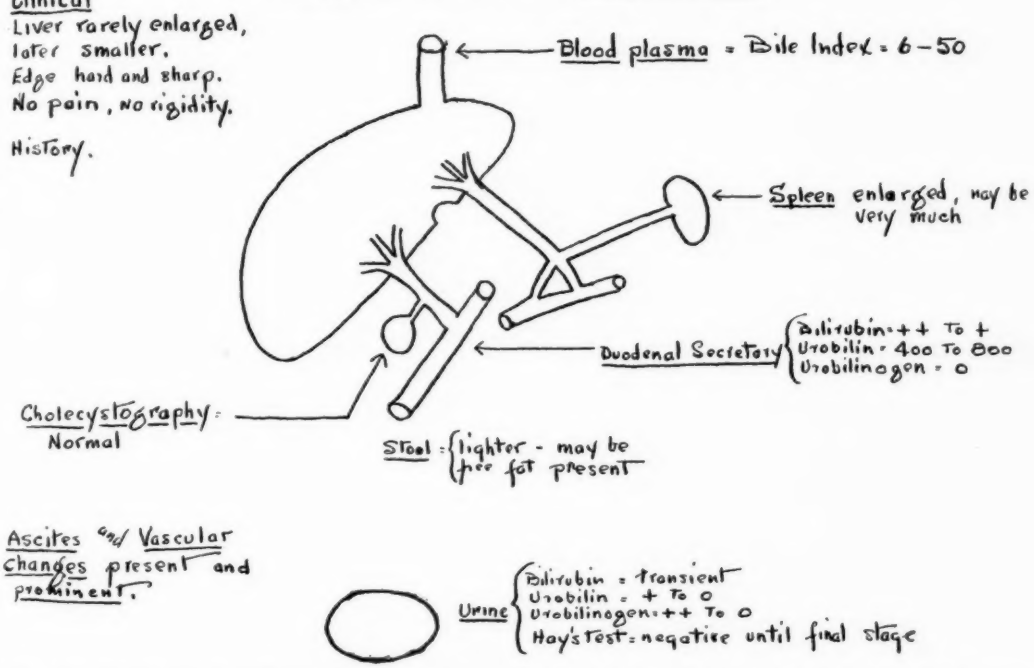
*Berger et al., Jour. Am. Med. Assn., April 10, 1925.

the adult is between 1,000 and 2,000 c.c. Normally the larger ducts add much mucin. The color is golden yellow but may apparently, in health, vary into the brown or green, depending upon oxidizing or reducing bacteria in the liver or ducts or both, acting upon bilirubin. The pigment forming the body of the bile is bilirubin, while in health urobilin also can always be demonstrated in the duodenum. The former can be estimated in a rough manner colorimetrically after conversion into biliverdin, or, like the latter, are reliable, since the excretion secured comes directly from the liver, provided, as I have advocated for years, one does not resort to drugs or food which bring the flood tide out of the gallbladder as oleic acid, strong peptone and sometimes magnesium sulphate will.

Bilirubin in the normal blood has a level of 3:200000. The kidney threshold in man is 1:50000. A twelve-fold increase is therefore necessary before bilirubin is excreted by the kidney and a still higher level before the skin reg-

VII

LAENNEC'S CIRRHOSIS (PERIVASCULAR)


Clinical
Liver rarely enlarged, later smaller.
Edge hard and sharp.
No pain, no rigidity.
History.
Blood plasma = Bile Index = 6–50
Spleen enlarged, may be very much
Duodenal Secretory
Bilirubin = ++ To +
Urobilin = 400 To 800
Urobilinogen = 0
Cholecystography = Normal
Stool = lighter - may be free fat present
Ascites and Vascular changes present and prominent.
Urine
Bilirubin = transient
Urobilin = + To 0
Urobilinogen = ++ To 0
Hay's Test = negative until final stage

No pain (spontaneous) until very late in the disease when pain may simulate cholelithiasis (without stones being present) especially if acute yellow atrophy supervenes. In cirrhosis hepatis we are dealing with the results of disease alteration and of compensatory effort as in contracted kidney. As with the kidney the *anatomical* decline is much more marked than the physiological. Its excretory function is relatively well retained until very late and the brunt of the changes are in the tributary vascular field just as in the kidney the circulatory features are in the foreground. During an intercurrent infection with even mild hepatitis such a liver will show immediately retention signs of high degree (bile index, etc.). The steady changes are portal-hemorrhoids, ascites, esophageal varices, stasis in the gastric and bowel mucosa with lowered function, etc.

measured by spectrometric or photospectrometric methods.

"B" bile of Lyon is not what he contends, pure gallbladder bile, but liver bile, as has been repeatedly demonstrated by duodenal work in patients with no gallbladder or in animals with the cystic duct ligated.

For liver testing, then, duodenal pigment studies isters. Bilirubin does not readily leave the blood vessel normally—lymph vessels rarely even show a trace except upon the addition of another factor producing friability of vessels. The liver threshold for urobilin is certainly many times lower and the kidney threshold approximately 1:500000. This results in instances of mild parenchymatous swelling of the liver, passive venous

congestion, toxic reaction or transient lymphangitis of the radicles of the gallbladder and near parenchyma producing very quickly an overflow of urobilin and urobilinogen down the biliary tract and back into the blood pool with its early appearance in the urine.

Increased drinking of liquids often increases the total quantity of bile to over 2,000 c.c. per twenty-four hours but does not increase the total bilirubin content—the bile is simply thinner and of lower specific gravity.

Increased muscular effort, if not accompanied by very much increased fluid intake, leads very decidedly to thickening of the bile, higher concentration of pigment and increased total pigment output—both due to fluid loss and to increased transport of effete corpuscular waste to the liver.

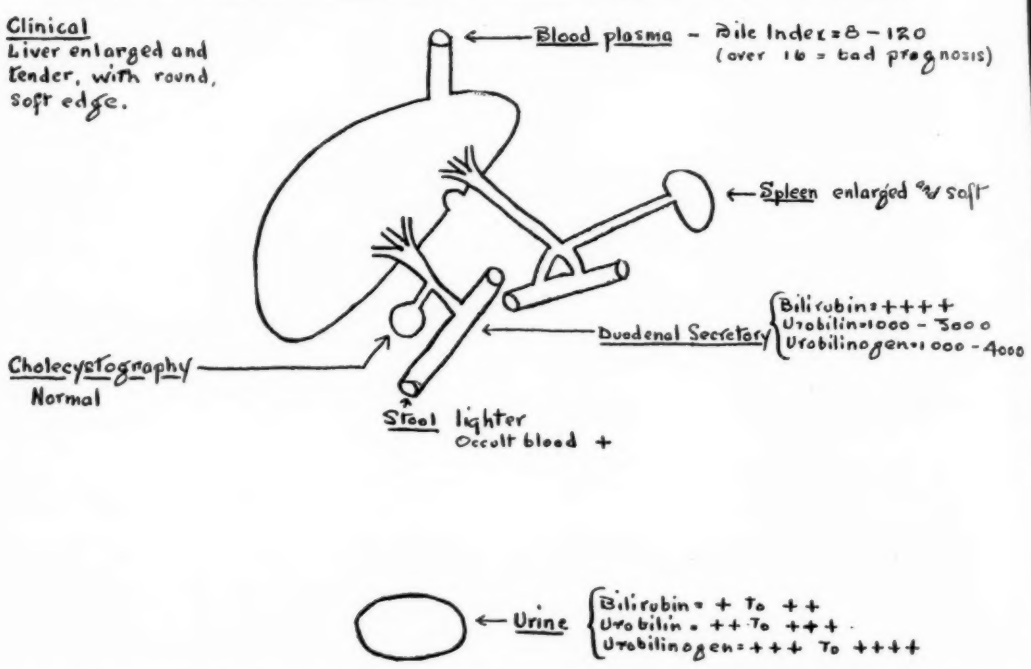
Fasting is attended by increased bilirubin content of the blood, due, in all probability, to the lack of the pace-making influence on bile secretion and liver activity of the bile salts which in the fasting state are not actively absorbed from the bowel. Here, then, is chemical evidence of that uncomfortable "bilious" feeling attendant upon the "empty state."

The direct food influence on the bile index in the blood is negative, there being no tide such as we find in the metabolism of the sugars.

The emptying of the gallbladder and increased activity of the liver following the ingestion of fat may be due to specific stimulation of bile salt production. This remains to be seen. That constipation as against normal daily movements of the bowel has no influence is definitely established. However, a cathartic effect upon the small bowel, particularly that of magnesium sulphate, is to sweep out much bile pigment—bilirubin as well as urobilin—which would otherwise be resorbed and revamped. To repeat this fre-

VIII

PASSIVE VENOUS CONGESTION OF LIVER (HEART & LUNG DISEASE)



In acute congestion of the liver following diphtheritic myocardial disease, paroxysmal tachycardia or coronary thrombosis (especially of the right coronary) and tricuspid regurgitation secondary to decompensated mitral disease, the pain is severe in the right hypochondrium. The effect of digitalis can be determined with remarkable accuracy by daily urine pigment determinations as well as bile index values. When the bile index in chronic congestive failure in spite of good treatment remains steadily over fifteen or sixteen, the prognosis is not good.

quently, however, can well be conceived to lead to lessened bile flow and liver function due to bile acid depletion.

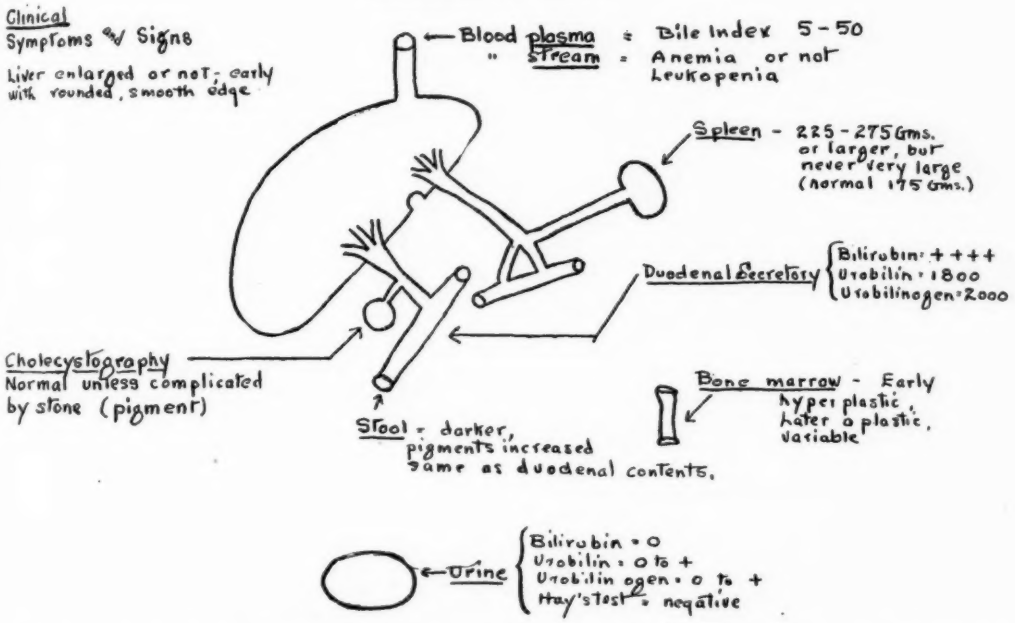
Menstruation, particularly at the onset, is attended by a heightened tonus of the sphincter of Oddi and consequent increased intraductal pressure against which the liver must excrete. How much the liver is actually inhibited, if at all, is not established. During normal pregnancy the biliary pigments are not altered from the normal although some work done points to an increased duodenal content of urobilin and at times urobilinogen, a pathological pigment in such patients as have simple vomiting of pregnancy without manifest toxemia. In the toxemia, decided evidence of liver injury can be obtained by the duodenal estimations by the blood bile index, and the play of pigments in the urine. The impression is forced on one that the pregnant state is one which taxes the liver function to its utmost. During the puerperium, while the uterus is involuting and the blood debris is being resorbed, there is an increased concentration of the normal pigment, bilirubin, and of cholesterol in the bile output.

The liver secretes against a pressure in the common duct of 60 mm. of water. The sphincter of Oddi has a resistance of 120 mm. of water, the cystic duct only 30 mm. Hence, during expiration the gallbladder fills—during inspiration, due to increased intra-abdominal pressure, the pressure in the gallbladder rises to 100 mm.

Tonus changes are to be added—especially such as occur as a result of emotion, menstruation period, etc. The gallbladder mucosa has great concentrating ability so that many more

IX

PERNICIOUS ANEMIA


Clinical
Symptoms & Signs
Liver enlarged or not; early with rounded, smooth edge
Blood plasma = Bile Index 5-50
" stream = Anemia or not Leukopenia
Spleen - 225-275 Gms. or larger, but never very large (normal 175 Gms.)
Duodenal Secretory
Bilirubin: ++++
Urobilin: 1800
Urobilinogen: 2000
Cholecystography
Normal unless complicated by stone (pigment)
Bone marrow - Early hyperplastic, later aplastic, variable
Stool - darker, pigments increased same as duodenal contents.
Urine
Bilirubin: 0
Urobilin: 0 to +
Urobilinogen: 0 to +
Hay's test: negative

The change in the liver in pernicious anemia is produced largely by two factors: (1) overwhelming hemosiderosis—this pigment debris leading gradually to cirrhotic changes precisely as produced by any other foreign material; (2) toxic fatty degeneration. The liver always enlarges during the crises of the disease and recedes during the remission. Later, as the liver hardens, the changes are less marked, but the liver may again enlarge following cardiac failure. The spleen also goes through parallel changes but they are less marked and often in the elderly patient cannot be demonstrated.

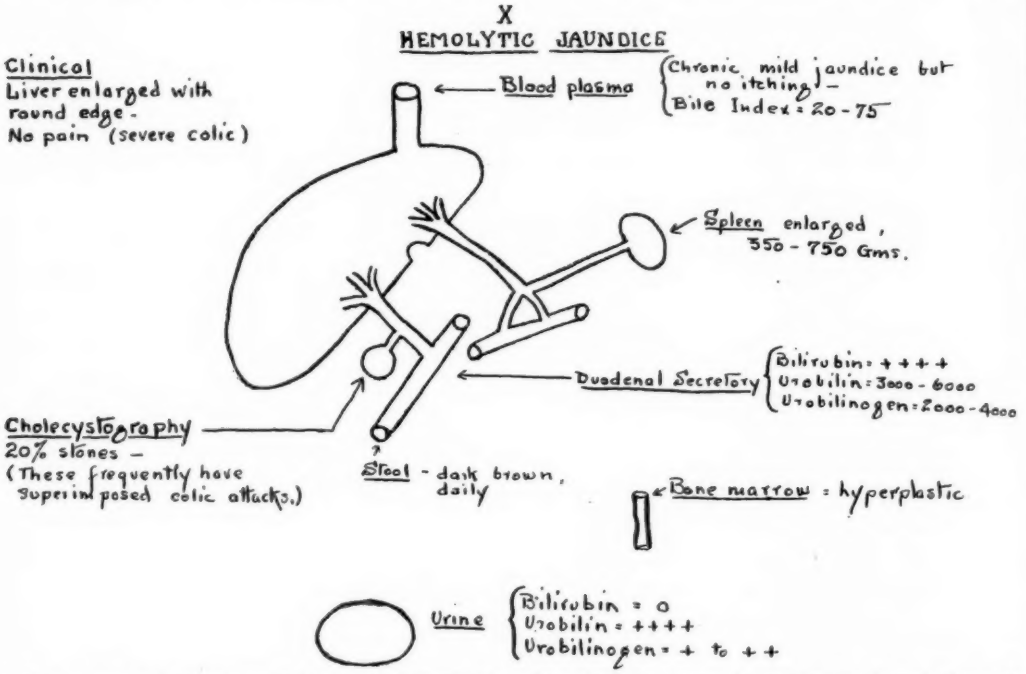
The relief in pernicious anemia from splenectomy is probably accounted for by removing one-third of the portal blood flow to the liver, and in that degree saving it from the flood tides of pigment. The operation of enterostomy (Seyderhelm) during its existence drains away much pigment that must otherwise be resorbed and rehandled by the liver. Other than that it does not influence the disease.

times the volume enters than leaves it. After cholecystotomy the sphincter of Oddi resistance drops to 30 mm.

The gallbladder function may be summarized as follows:

1. Fills during fasting. (Hence five feedings per day in cholecystic cases accounts for relief obtained.)
2. Empties following food ingestion—the rapidity very markedly influenced by character of food.
3. Protein and carbohydrates six to twenty-four hours and often never at any stage completely collapsed.
4. Fat, especially a mixture of egg-yolk and cream, causes a completely collapsed gallbladder in two or three hours.
   (This phenomenon accounts for qualitative dyspepsia in gallbladder disease, especially the intolerance to fat, mayonnaise dressing, etc.).
5. There is still doubt as to how much aside from water of the gallbladder contents is expelled through the cystic duct and how much and what substances are resorbed through the gallbladder mucosa.
6. Muscular effort attended by perspiration lessens volume of bile entering gallbladder and very greatly lessens the unit work of the gallbladder.
7. On the contrary, a sedentary life, especially attended by much liquid consumption (beer in the days of alcoholic cirrhosis), greatly enhances the work of the gallbladder for two reasons:
   (a) Increased volume of liver bile needing to be concentrated by gallbladder.
   (b) Lack of respiratory activity retarding emptying of gallbladder.
8. Pregnancy and the menstrual period are attended by at least three now well grounded reasons for forming gallbladder disturbances:
   (a) The proven increased tonus of the sphincter of Oddi at both periods (pituitrin?).
   (b) The tremendous burden placed upon the biliary apparatus following delivery from cholesterol enhancement.
   (c) The decreased intra-abdominal pressure offering insufficient resistance to descent of diaphragm and decreased respiratory emptying of gallbladder.

X



The spleen and splenic vein in acquired hemolytic jaundice are the seat of the disease. Splenectomy results in a cure.

The spleen is the large central station for pigment manufacture. This is anatomically evidenced by the fact that the artery is the largest branch from the celiac axis and the vein contributes 30 per cent of the entire portal vein volume. The change in the spleen is produced by a mechanical stasis—a local passive venous congestion of the spleen with a final fibrosis.

THE ROENTGENOLOGY OF GALLBLADDER

The very recent clinical application of the Graham-Cole method of visualization of the gallbladder by the use of the intravenous or oral administration of tetraiodophenophthalein marks an important milestone in the study and under-

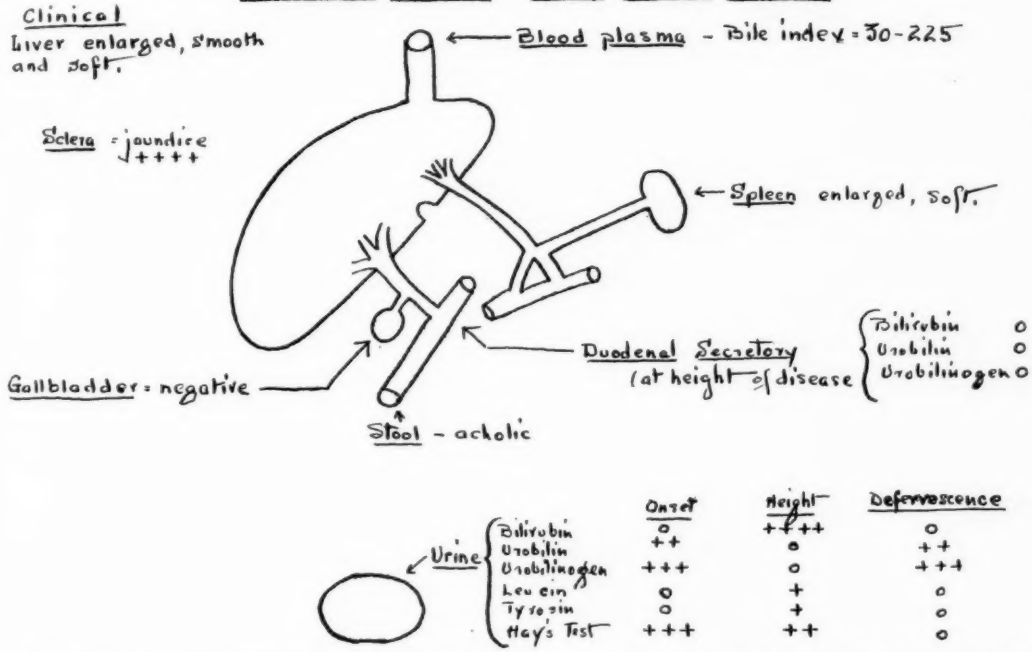
standing of the biliary tract. The gallbladder fills out with a uniform dense shadow taking on its shape and size twelve to fifteen hours after ingestion of the dye. After a meal, especially of egg-yolk and cream, the normal gallbladder at a second picture in three hours will be nearly empty or entirely so. After a mixed meal longer. Whatever its size it is like the stomach, always full, having, therefore, a function of peristole.

This new method has as in the case of the stomach taught us already certain errors handed down for clinical application derived from the post-mortem room or operating table.

1. That the gallbladder is not in the right hypochondrium in more than 25 per cent of the patients. That when it is there instead of being in the longitudinal line that separates the right hypochondrium from the epigastrium it is often in the line that separates the right hypochondrium from the axillary region.
2. In 75 per cent it is below the limit of the hypochondrium or epigastric region—either in the umbilical or right lumbar region. It may be at or on a line with the anterior superior spine of the ilium and what was formerly suspected to be a ureteral stone proves by cholecystography to be a gallstone.
3. The change in position from the lying to the standing position in the individual with normal tonus does not exceed one inch; in the relaxed visceroptotic, it may be three or four inches.
4. Many gallbladder shadows by our former technic were missed because the shadow fell upon that of the spine.
5. The acutely or subacutely inflamed gallbladder will not take the dye. This is particularly true soon after a cholecystic attack.
6. The obliterated contracted gallbladder will give no shadow.
7. The gallbladder with obstructed cystic duct also.
8. The chronic gallbladder may show a shadow which is deformed or horizontally placed (found at operation to be adherent to under surface of liver).
9. A gallbladder shadow of very large size, hydrops of the organ, or delayed emptying.

XI

CATARRHAL JAUNDICE – ACUTE YELLOW ATROPHY



Acute catarrhal jaundice of the infectious epidemic type which we see in this state particularly in the months of November and December is not serious and only once have I seen such a patient remain jaundiced for full eight weeks. There is a type following an unknown gastrointestinal infection which may go over into acute yellow atrophy or terminate in cirrhosis. When bilirubin persists in the urine for a week without a return of urobilin and Hay's test has been positive (the first day or two) then a permanent pathologic change of more serious character is to be expected.

Icterus during pregnancy if associated with hyperemesis, salivation or eclampsia is serious and needs careful evaluation, for acute yellow atrophy may set in with the usual fatal outcome. The process is probably autolysis of the liver brought about by tryptic ferments and is not unlike fat necrosis of pancreatic origin.

10. A normal gallbladder shadow—bearing within it one or more negative shadows (gallstones).
11. A late twenty-four to forty-eight hour picture of the gallbladder may give a series of ring shadows —coated gallstones.
12. While the dye is apparently without danger in deeply jaundiced patients no shadow of the gallbladder can be obtained irrespective of whether the jaundice is obstructive or infectious in type.
13. The study of the gallbladder by this method already has thrown great doubt upon the value of pain in the right hypochondrium or directly under the right rib margin as a diagnostic sign of gallbladder disease. Most frequently this is a traction pain.
14. In many cases where gallstones are visualized there appears to be a surprisingly good function (radiographically) of the gallbladder.

That such might well be the case can readily be appreciated by a glance at this classification of gallstone formation. At least 35 per cent of stones are formed as a result not of gallbladder pathology but disturbed liver function entirely aside from infection.

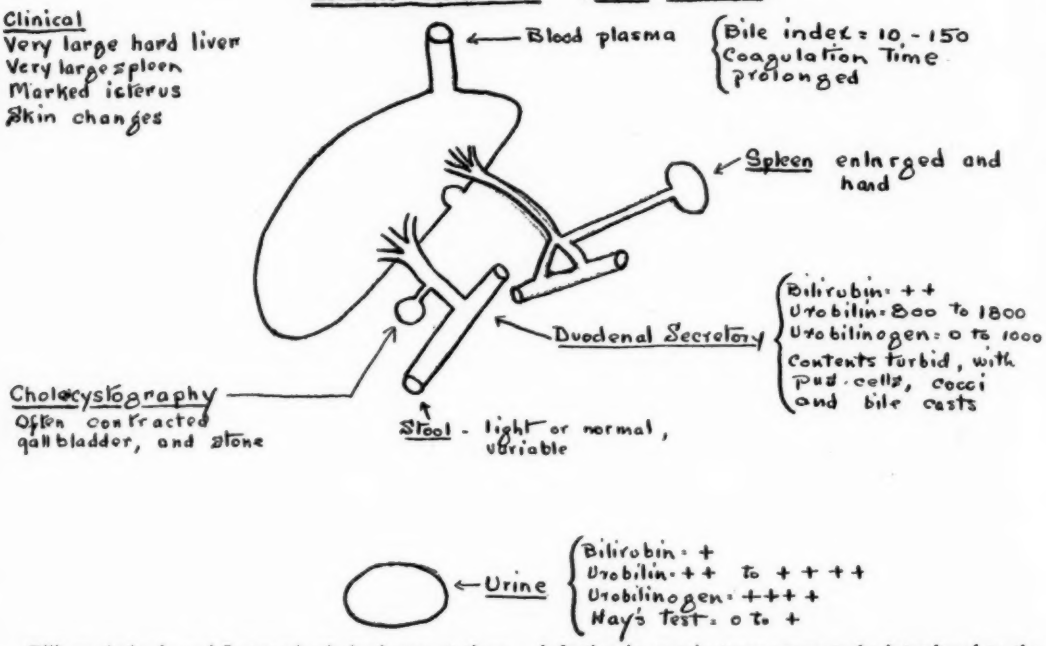
GALLSTONE FORMATION

I. *Inflammatory Stones* (60 per cent): Bilirubin, cholesterin, calcium stones.
   1. Precipitation of cholesterin out of colloid state in gallbladder and wall tufts.
   2. Crystallization in rosette formation around a nucleus.
   3. Agglutination into kernels with incorporation of bilirubin, calcium, bacteria, etc.
   4. Absorption until osmotic balance.
   5. Facet formation.
   6. Crop formation of stones.

II. *Cholesterin Stones* (25 per cent) always single.
   1. Metabolic stone—due to hypercholesteremia occurring in puerperium and hypercholesteremia of superalimentation.

XII

BILIARY CIRRHOSIS (PERI-BILIARY)



Biliary cirrhosis and Laennec's cirrhosis are at times mixed in type for etiologically there is very little distinction. The more marked bile tubule stasis in the former leads to infection and greater toxic effects. This infection in certain types seems to be introduced to the liver via the spleen so that splenectomy may markedly improve the liver—this being particularly true in syphilis with chronic nesting of spirochetes in the spleen.

   2. Round, hard, dark spiculated uniform throughout.
   3. Other stones added are of Type I.

III. *Bilirubin Pigment Stones*—multiple.
   1. As in preceding no macroscopic or microscopic evidence of present or past inflammation of gallbladder.
   2. Due to pleochromia—high waves of pigment concentration as result of fulminating blood destruction wave especially in *hemolytic icterus* and *pernicious anemia.*
   3. Uniform dark mulberry type.

IV. *Static Stones*—Form only in biliary passages plus obstruction, plus infection—egg-shaped yellow or brown, with layering of bilirubin.

The icterus index[10] has the following said for it:

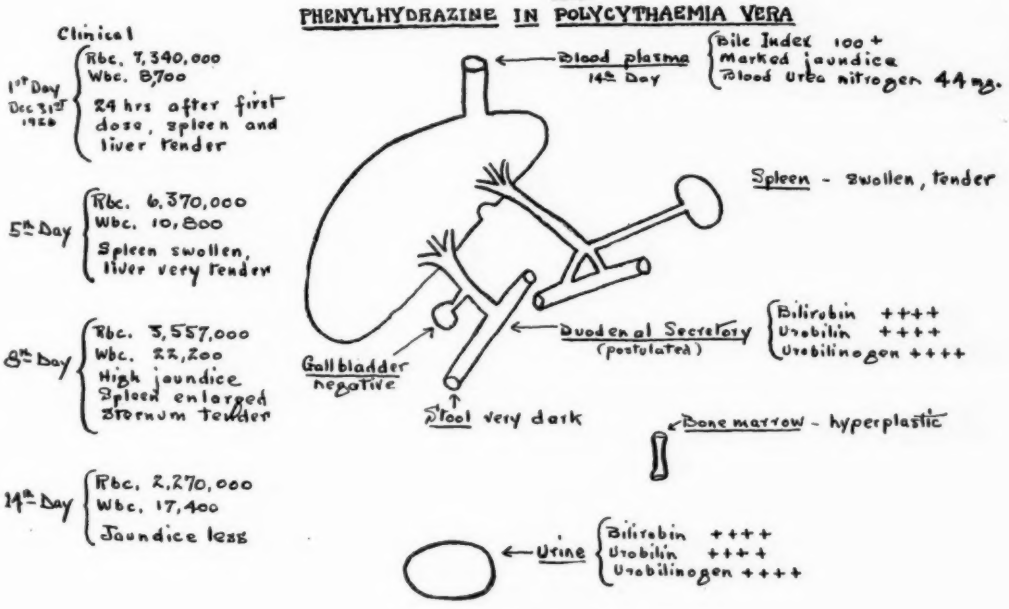
1. It is easily performed and is not dangerous.
2. Its greatest value is in the diagnosis of cases of cholecystitis and cholelithiasis without clinical jaundice.
3. It is differential between catarrhal jaundice (acute hepatitis) and obstructive jaundice due to malignancy by showing that the jaundice is increasing, diminishing or stationary.

great assistance in detecting cholecystitis and cholelithiasis is obvious from the facts as stated that a good deal of total liver injury or a common duct obstruction, or a very marked hemolysis is necessary for its radical departure from normal.

Recently we had occasion to treat a patient affected with polycythemia vera by the ingestion of a powerful hemolytic poison—phenaldydrazine. From a red blood count of 7,340,000 we were able to produce a diametrically opposite

XIII

PHENYLHYDRAZINE IN POLYCYTHAEMIA VERA



See text.

4. It is also of value in differentiating between malignancy and common duct stone.
5. It is indicative of the degree of cardiac decompensation.
6. It may act as a guide to the tolerance of the liver to arsenicals.
7. It may be useful in determining when obstructive jaundice has been relieved by operation.
8. It may be used to differentiate between primary and secondary anemia.

To properly evaluate the icterus index, its value must be taken with the duodenal and urinary values as well as the roentgenological and clinical facts. The time element must be carefully considered. That it will not probably be of

condition of anemia with a red blood count of 2,700,000 in the course of fourteen days. The clinical picture was one of fulminating liver disease to the uninitiated. The patient became heavily jaundiced; the spleen fairly popped into prominence; the liver bulged and there was a vivid distress in the right hypochondrium; the patient vomited bile repeatedly and the urine was freighted to the guards with pigment, and the bile index in the blood much over one hundred. If we had performed duodenal drainage, which we spared the too sick patient, we would without doubt have found extraordinary high values for bilirubin, urobilin and urobilinogen. Yet, withal, there was not the slightest clinical point to be made out for liver injury. The entire destruc-

tive play was in the blood bed, and, from the cellular studies of the blood, made by Drs. Carey and Altnow, we are sure in the marrow. If this overwhelming pigment excretion had been kept up (which was of course impossible because of insufficient supply) then it is conceivable that an injury of the liver itself would of necessity have resulted as it does in all chronic hemolytic disease.

This experience enables us the better to see why we have, in the past, been so often misled, just as we did in the field of kidney pathology, into regarding the liver as guilty because of its proximity to the greatest evidence of the injury.

With this experience in mind it is not inconceivable that we will find in the future that many toxic actions of bacteria (such as the toxins of the streptococcic group) are not producing the signs of liver injury as a result of liver cell destruction but as a result of hemotoxic action. That this blood destruction can occur very rapidly and that recovery will occur when the bacterial invasion is a transient one is evident from cases of acute pernicious-like anemias such as were reported recently by Lederer,[11] Brill,[12] and E. Moschowitz.[13]

SUMMARY AND ADDENDA

The most accurate and delicate single liver parenchyma function test in the absence of total duct obstruction is the play of urobilinogen in the fresh urine. In the presence of total duct obstruction and consequent jaundice the best functional test is the oral administration of bilirubin with the urinary consequences. In this latter situation, if the parenchyma is normal, no urobilin will appear in the urine; if it is damaged, the degree of damage at the time of the test will be reflected proportionally in the urine. It goes without saying that hemolytic disease must naturally first be excluded.

The small amount of urobilinogen normally found in the urine is the urinary factor—the stool pigment the other—of the total end pigment output of the normal daily blood destruction. When testing in *fresh* urine adding 1 c.c. of Ehrlich's aldehyde reagent (paradimethylamidobenzaldehyd 2 gms., 15 c.c. of 38.5 per cent HCl, 15 c.c. of H_2O) to 5 c.c. of urine will in the presence of the pigment give in *cold urine* in one or two minutes the characteristic red color. If the reaction is in doubt add a few c.c. of chloroform and shake, when the latter will take up the color in a clear solution.

If green pigment comes out and confuses, this is bilirubin converted into biliverdin by uric acid in the presence of nitrites. These latter occur in putrefying urines, but also in fresh urine from urinary tract infected with organisms liberating nitrites. Indol and skatol (pyrrhol derivatives) give the aldehyde reaction but are never in sufficient quantities in the urine to be of clinical importance. Urotropin inhibits the color reaction entirely—a clinical fact that should be borne in mind.

In testing for urobilin Schlesinger's solution (1 per cent zinc acetate in 95 per cent alcohol) is used. To 5 c.c. of urine are added two or three drops of Lugol's solution and the same allowed to stand a few minutes. Two or three drops of ammonia are added and 5 c.c. of Schlesinger's solution and filtered and the filtrate examined for green fluorescence; allowing the light to shine through the test tube diagonally against a dark background.

Leucin and tyrosin are difficult of demonstration. Clinically, to determine liver destruction, it is better to test in the urine for amino acids by the use of Millon's reagent. A very dark red color is positive.

Hay's test for bile acids in the urine is clinically very useful, but has certain errors unless great care is exercised in using only perfectly dry sulphur, allowing none to touch the sides of the conical glass and reading the result in five minutes, not later.

In the examination of the fresh stool or stool protected from light exposure for the presence or absence of urobilinogen it suffices to take a hazel nut size piece of stool in 5 c.c. of a warm solution of 1 per cent tartaric acid in 95 per cent alcohol, and shake to extract the pigment, and filter. Then add 1 c.c. of the aldehyde reagent and extract the color with a little chloroform. The tartaric acid alcohol extract prevents indol and skatol bodies from entering the reaction, as of course they are very abundant in the stool.*

The bilirubin liver function test in the presence of complete obstruction can be carried out as follows: For each ten pounds weight of the

*For the technic of duodenal pigment estimation see "The Splenic Pathology of Pernicious Anemia and Allied Conditions, A Duodenal Method of Estimating Hemolysis," J. P. Schneider, M.D., Arch. Int. Med. 17:32 (Jan.) 1916.

patient give by mouth one-half grain of chemically pure bilirubin. Save all the following twenty-four hour urine in a dark glass bottle. Test a sample from this for urobilinogen. If it is absent the liver parenchyma can be assumed to be still functioning well. If it is present, the stronger the reaction, the poorer the total parenchyma is functioning, at the time the bilirubin was given.

BIBLIOGRAPHY

1. Rous, Peyton: Biliary aspects of liver disease. Am. Jour. Med. Sc., 170, 625, (Nov.) 1925.
2. Schneider, J. P.: The splenic pathology of pernicious anemia and allied conditions. A duodenal method of estimating hemolysis. Arch. Int. Med., 17, 32, 1916.
3. Schneider, J. P.: The hematopoietic-hemolytic index: A proposed determination helpful in the differential diagnosis of types of pernicious anemia amenable to cure via splenectomy. Journal-Lancet, Feb. 15, 1917.
4. Schneider, J. P.: Further quantitative study of the duodenal blood-derived pigment. Arch. Int. Med., 19, 156, 1917.
5. Schneider, J. P.: A study of the bile pigments in pernicious anemia. Jour. Am. Med. Assn., 74, 1759, 1920.
6. Platou, E. S.: Schneider's test in pernicious anemia. Case report. Coney Island Med. Jour., 15, 272, (Aug.) 1921.
7. McClure, C. W.: Studies in pancreatic function: Enzymic concentration of duodenal contents in health and disease. Am. Jour. Med. Sc., 167, 649, (May) 1924. Also the ph. and buffer values of duodenal contents derived from normal men. Arch. Int. Med., 33, 525, (Apr.) 1924.
8. Boyd, W.: Studies in gallbladder pathology. Brit. Jour. Surg., 10, 337, (Jan.) 1923.
9. Berger, Cohen and Selman: Liver function tests. A comparative study of five methods in one hundred clinical cases. Jour. Am. Med. Assn., 86, 1114, 1926.
10. Murphy, W. P.: Easy method of estimating amount of jaundice by means of blood serum. Bost. Med. and Surg. Jour., 194, 297-299, Feb. 18, 1926.
11. Lederer, Max: A form of acute hemolytic anemia, probably of infectious origin. Am. Jour. Med. Sc., 170, 643, (Oct.) 1925.
12. Brill, I. C.: Acute febrile anemia. Arch. Int. Med., 37, 2, Feb. 15, 1926.
13. Moschowitz, E.: Acute febrile pleiochromic anemia. Arch. Int. Med., 36, 1, (July) 1925.

UROLOGIC DIAGNOSIS IN GENERAL SURGERY*

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The work of the surgeon of today includes far more than mere "operating" or cutting tissues. With a reasonable natural adaption and practice, the technic of surgery is rather easily acquired, if one speaks of surgery as merely cutting, draining, removing or transplanting tissues.

Surgery in its broader sense, to be worth while, includes a thorough knowledge of anatomy, pathology, history and progress of disease, as well as diagnostic acumen and judgment. It implies, further, equipment and training which enable one to arrive at a diagnosis and adopt a well-laid plan of procedure in attacking the disease at hand. Further, it requires a checking up and evaluation of the body structures and functions as a whole; as to cardiovascular, renal, hepatic and internal secretory status and efficiency, so as to determine the exact state of function and organic reserve.

The study of such functions in operative cases has made possible the brilliant and more safe operative interference in thyroid, hepatic, diabetic, prostatic and gastrointestinal surgery of recent years. Much of the guesswork and hope of former days has progressed to fact and faith of today. All this has been made possible by the combined work of the internist, laboratory and experimental worker, as well as the surgeon and the specialist in various lines.

This also means that when the patient arrives on the operating table, a thorough estimate of his organic functional resources has been established, and likewise a definite diagnosis of the existing disease has been carefully made—an accumulation of the efforts of many lines of endeavor.

Furthermore, even though a patient has a disease which ordinarily would suggest operative interference, unless the chances of this patient are better by operation, judged by a proper review of all the organic functions of the body, operation should be deferred or definitely abandoned, and such other treatment, alone or followed by surgery, should be undertaken, as is found best for the particular case at hand. Many a patient would be saved operation, or the latter would be

*Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 17-19, 1926.

better directed, if these factors were always considered.

In the old days of fee splitting and hurried operation of patients with their shoes on, the patient had no fair chance. The scientific and honest surgeon will not operate, but refer his patient to other departments for coöperative care and treatment, rather than go ahead unprepared and in a hurried way.

It is for these reasons that surgery today does not mean merely "operating," but it does mean the application of therapeutic measures, as indicated: operating if needed, and then only after thorough functional and diagnostic studies have been made. The field is broad, requiring the coöperation of all departments of medicine; likewise the training of surgeons in more than mere technic.

These introductory remarks lead us to the subject at hand, illustrating one field of many in which the surgeon should be trained, in diagnosing disease and preparing patients for operation, namely, urology. Urology as a specialty has been developed in the last two decades to the eminent position of a rather exact science. Many illustrious names are interwoven in the story of the development of the diagnostic and operative procedures used in this work. The laboratory worker has rendered invaluable aid in perfecting blood chemistry and functional kidney tests; the *x*-ray specialist is at hand with his intelligent coöperation; the medical clinician rounds out the team work in applying and correlating these laboratory tests—all to the advantage of the surgeon, who applies the final indicated therapeutic measures.

Differential diagnosis finds urologic diseases often mistaken for other surgical conditions; for instance, an innocent, as well as a moderately diseased, appendix has been removed instead of a calculus lurking in the ureter. Useful and harmless female generative organs have been sacrificed, before a ureteral kink or stricture was discovered and remedied. Because of relatively obscure symptoms and signs, and the occasional difficulties of technic in diagnostic procedures, the simpler and more common operations have been hastily done, while the real and more obscure, even though more important, cause has been overlooked. Still more tragic are the cases of acute pyelitis that have been operated for intestinal obstruction because of the accompanying tympany, constipation and vomiting. Patients have had an innocent prostate removed, when the obstruction was due to a urethral stricture, or phimosis, or hypospadias with attendant obstructive cystitis.

These are but a few examples which come to mind in a review of the cases which very often come to the busy surgeon for operation.

Needless pain and expense and loss of time is offered up on the altar of ignorance and haste, and life is made less pleasant and sometimes sacrificed because a vital member of the urologic system is strained by the anesthetic or the operative shock of an unhappily chosen time or field of attack, or of an unprepared body as a whole.

It is our plea that the man who would do surgery should have a working knowledge of these things, or have access to them through his colleagues.

In conclusion, the general surgeon should have a working knowledge in urologic conditions as to structure and function. He should be personally qualified to make the necessary examinations and tests, or coöperate with those who are. With the aid of the internist, laboratory specialist and roentgenologist, he should get all available data of the patient, as well as the local findings. Finally, the day of the mere technical operator has passed; biology and physiology and their relation to disease must be taken as a whole, before conclusions are drawn and a plan of attack is formulated. This will give the clue and indication as to whether or not to operate, what to operate, when to operate, and include a well-rounded after-care for the treatment of local and general conditions.

CASE REPORTS

Case 1.—Mrs. L. R., aged 33, comes because of indefinite pelvic symptoms, including bladder irritation and pain radiating up to the lumbar region. Routine examination included cystoscopy, which showed the patient had a double ureter on the left side, this duplication being limited to the lower end of the ureter, and extending only 3 cm. There was no other pathology in the urologic system, the symptoms being traced to a chronic infection in the tubes and ovaries, which condition was cured by a later operation.

Case 2.—Mrs. C. Z., aged 57, was referred because of continued colicky pains in the kidney region. Pyelogram showed a hydronephrosis on the left side, with obliteration of the calyx markings.

Case 3.—Mr. A. C. V., aged 45, comes because of indefinite abdominal discomfort, with occasional colic, which made one suspicious of kidney calculus. There was an apical tooth infection present, and a calculus 3 x 8 mm. was shown by *x*-ray to be near the upper pole of the left kidney. Re-ray with ureter catheter *in*

situ gave the same findings. This stone was removed by pyelotomy under fluoroscopic observation.

Case 4.—Miss M. T., aged 31, was referred because of indefinite abdominal symptoms somewhat suggestive of Dieti's crisis. *X*-ray examination with barium meal suggested cholecystitis, but there was also a small renal calculus in a slightly ptosed right kidney, this calculus being 3 mm. in diameter and situated near the upper pole of the right kidney. There was also evidence of a moderate kidney infection. At operation, a cholecystectomy was done, because of chronic infection. At the same time the kidney was exposed through the same incision, which was a modified T incision of the right abdomen, and it was found that the upper third of the kidney was degenerated, the rest of the kidney being in good condition. This third of the kidney was removed, leaving the healthy two-thirds of the kidney in place. On re-raying, it was found that the calculus which caused the closure of the upper kidney calyces had not come away with the diseased kidney portion, and symptoms of a moderate degree continued, so that two months later it was decided to remove the stone. It was found that the kidney wound had healed very nicely, except that a small sinus about 1 cm. in length led from the pelvis to the kidney stone, which was in the cellular tissue outside of the kidney and was the cause of the continued kidney irritation. The stone was easily removed and the patient made a quick recovery without any leakage from the kidney.

Case 5.—Mrs. O. S., aged 24, during the course of an insurance examination was found to have evidence of kidney infection—pus and red cells being in the microscopic urine. There was a dental infection present, and cystoscopic examination showed a stricture in the left ureter. Pyelogram showed evidence of this stricture in the course of the left ureter, and also a filling defect suggestive of stone. This patient had virtually no symptoms until infection in the urine was discovered during a routine examination, and yet she had a virtually dead kidney above a strictured ureter, with impacted stone.

Case 5.—Mr. C. B., aged 58, was referred because of pains following an injury several months previous, with hematuria. Cystoscopy showed an almost complete stricture of the right ureter two inches from the bladder, with a moderate stricture of the left ureter. A pyelogram showed filling defect suggestive of stone. The urine contained no blood at this time, but the interesting thing about this case was the very advanced spondylitis deformans present. From a legal standpoint, it was important to distinguish between the actual result of the trauma and a disease of long standing as suggested by the spondylitis and kidney stone with ureteral stricture.

Case 7.—Mrs. N. A. D., aged 36, following a difficult labor, continued to have pelvic discomfort with occasional sharp lumbar pain and vesicle tenesmus. There was evidence of chronic pelvic infection, but *x*-ray also showed a small stone in the pelvis of the left kidney. Under manipulation with a ureter catheter, this stone was removed.

Case 8.—Mr. R. E. H., aged 33, was operated for appendicitis a few months ago, but continued to have symptoms of sharp pain in the right inguinal region. *X*-ray with a catheter in situ showed two calculi impacted in the lower end of the right ureter. These were removed under ureteral catheter manipulation.

Case 9.—Mr. E. B., aged 26, came in with indefinite abdominal pain. *X*-ray showed a faint shadow near the right uretero-vesical junction. Cystoscopy showed obstruction at this point. After repeated catheter manipulation, this stone was removed.

Case 10.—Mrs. H. M., aged 46, had several operations including cholecystectomy and gastroenterostomy, because of indefinite abdominal pain, associated with cholecystitis and pyloric ulcer. She continued to have discomfort, however, although her gastric symptoms had improved. *X*-ray showed a small calculus in the region of the left uretero-vesical junction, which was removed by catheter manipulation.

Case 11.—Mrs. C. K., aged 30, had symptoms suggestive of kidney colic. *X*-ray showed an opaque shadow 8 x 15 mm. in the region of the left lower ureter. *X*-ray repeated with catheter in situ showed this calculus to be in the ureter. Catheter manipulation was used to remove the stone, but the patient did not return for a check-up, because after changing the position of the stone to allow the ureter to drain, her symptoms were relieved.

Case 12.—B. E., aged 36, was referred for probable appendicitis. Examination showed a leukocyte count of 20,300. Urine showed only occasional pus cells. However, the nature of the pain and the tenderness, which was more marked in the left kidney region, with some tenderness along the right ureter, made one suspicious of kidney involvement, and the case was studied further. *X*-ray showed both kidneys normal in size and position. On the right side, apparently in the course of the ureter, at a level of the transverse process of the fourth lumbar vertebra, was seen an opaque shadow about 1 cm. in diamter and of somewhat irregular density. At this time no stone was observed in the left side. Tenderness was more marked in the left kidney. The urine still showed but few pus cells and an occasional red blood cell. The catheterized urine gave a growth of pure staphylococcus. Cystoscopy showed a general cystitis, with the right ureter obstructed six inches from the meatus and obstruction of the left one four inches from the meatus. Further study showed that a stone also existed on the left side. In other words, this patient had a chronic pyelitis, with stone impacted in each ureter. Repeated catheterization and dilatation of the ureters, done over a period of two months, did not cause the stone on the right side to move at all, and the one on the left side merely moved up and down. Because of the danger of complete obstruction, it was decided to remove these stones by open operation. Through an incision along the right rectus border, the right stone was removed extraperitoneally. It was impacted in the ureter, so that it had to be pried out, even after it was exposed by incision into the ureter. Then the appendix was removed, which showed chronic disease. Eleven days later, a left extraperitoneal ureterotomy was done, and the left stone was removed. There was a decided stricture below this stone. The patient made a prompt and good recovery.

Case 13.—W. J., aged 25, single, was referred with a history of left renal colic. At home the physician took an *x*-ray which showed a shadow suspicious of calculus in the left kidney pelvis, and wanted a left pyelotomy done for the removal of the stone. A re-ray a few days later showed no stone in the left kidney, but a stone in the left lower ureter. There was complete blocking of this ureter, with intense pain because of back pressure. Two catheters were put in the ureter past the stone and left in for twenty-four hours. This was repeated several times during a period of several weeks, and the patient passed the stone spontaneously.

Case 14.—J. H. Q., aged 60, came because of a number of severe attacks of pain in the right side, shooting towards the bladder. The *x*-ray findings showed both kidneys clearly outlined, and normal in size and position. A large circular shadow 6.5 cm. in diameter with calcium deposit on the edges was seen in the region of the gallbladder. A small shadow 8 mm. long was present in the region of the right uretero-vesical junction. A re-ray with ureter catheter in position shows the catheter in contact with a calculus at the ureteral opening, with obstruction. The cystoscopy shows a swollen ureteral mouth, with obstruction to the catheter.

Case 15.—E. M., aged 30, single, gave a history of abdominal operations for appendicitis, peritoneal adhesions, retroverted uterus and more adhesions, performed various times, and yet she has spells of typical Dietl's crisis. Pyelograms showed both kidneys ptosed. The lower pole of the right kidney was opposite the fourth lumbar interspace; the left opposite the third. The right kidney pelvis and calyces was normally filled. A slight kink appeared at the junction of the kidney pelvis and ureter and a right angled turn of the ureter at the pelvic junction. The left kidney pelvis was filled normally, but a definite kink at the junction of the ureter and kidney pelvis was visible. This ray was taken with the head of the table lowered. This patient had colic occasionally on the right side, but most frequently and more severe on the left side.

Case 16.—Mrs. O. C., aged 40, married, gave a history of having been treated for gallstone colic for over a year. She was referred because of suspected kidney colic. This patient had an alkaline urine, with pus cells 4. *X*-ray showed a calcified area in the region of the bladder, 3 x 6.5 cm., apparently a vesical calculus, and suspicious shadows in the kidneys. Cystoscopy showed the bladder wall to be covered with encrustations, and a large stone as big as a hen's egg. These stones were of a phosphatic type and were taken care of by acid-producing diet.

Case 17.—Mrs. M. A., aged 77, a widow, had had diabetes for years. She had had nocturnal pain in left flank, radiating into abdomen and bladder, which resembled renal colic. This was accompanied by dysuria and frequency which morphia or codein relieved. She also gave a history of recurrent attacks of sciatica on the left side. The urine appeared negative. Roentgenograms of the kidney and spine were made, the plates showing what seemed to be a large bladder stone. It was suggested that this be removed by lithotrite. A few days later, cystoscopy showed no stone in the bladder. A re-ray with cystogram showed this shadow to be posterior and above the bladder. Bimanual examination revealed a nodular uterine hardness. It was suspected that this shadow was caused by a calcareous uterine body, and because of great discomfort from pains requiring morphine for relief, it was decided to do a hysterectomy. This was done under sacral anesthesia, with suprapubic infiltration, and about 20 c.c. of ether for inhalation. The uterus had a body 4 x 3 inches, with a hard calcareous nodule, 4 cm. in diameter.

Case 18.—E. B., aged 30, gave a history of backache for three or four years, repeated attacks of sore throat and slight fever. The urine contained a few pus cells. Attacks suggested kidney stone because of their colicky nature. An *x*-ray showed what appeared to be a calculus in the left ureter opposite the fourth lumbar vertebra, and in order to identify this, cystoscopy and ureteral catheterization was done, showing quite an obstruction several inches up the left ureter. Stereoscopic *x*-ray showed in one plate that this obstruction was exactly at the tip of the ureter. With a history of renal colic and evidence of slight infection in the kidney, one would conclude that this patient had a ureteral stone, obstructing at this point. However, when the picture was put in the stereoscope, it showed that this shadow was at a level posterior to the ureter. In examining the patient's back, it was found that he had a pigmented wart on his back, which was causing the shadow.

THE USE OF CODEINE

In a report by Dr. Carleton Simon to the Louisiana State Board of Health, it is stated that an extremely large quantity of codeine is consumed in Louisiana, but this, Dr. Simon believes, has no connection with addiction. Its use has been largely increased by the reduction in available heroin. In Dr. Simon's opinion, a connection between codeine and drug addiction has not been demonstrated, but the use of codeine may produce a familiarity with the action of narcotics. The use of codeine is held to be objectionable, also, in that it encourages the cultivation of the poppy plant and stimulates the importation of opium into the United States. (Jour. A. M. A., Sept. 11, 1926, p. 853.)

K-17, OR RATTLESNAKE OIL, DEBARRED FROM THE MAILS

The Greene Laboratories (which were not laboratories at all) was a trade name adopted by Cooley H. Greene and his wife, and the business consisted in the advertising and sale through the mails of an alleged cure for deafness called K-17, formerly known as Rattlesnake Oil. The stuff was manufactured by George A. Breon, Kansas City, who, presumably, is the same George A. Breon who comes to the medical profession in the guise of a manufacturer of alleged reputable pharmaceutical products. On April 3, 1926, a fraud order was issued debarring the Greene Laboratories and C. H. Greene from the use of the mails. (Jour. A. M. A., Sept. 18, 1926, p. 959.)

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EDITORIAL

The Physiological Point of View

Clinicians have viewed with great appreciation the tendency of pathologists to come directly into their conferences. This coöperation has helped out immeasurably both of these great medical fields. A better understanding has resulted in a more reasonable nomenclature; each knows the difficulties besetting the other. Pathologists are among the first to agree that studies of form and structure alone do not suffice to determine how either the body or its component organs may function.

Medical schools have not failed to appreciate the great importance of physiology, but up to date this great scientific branch, together with its closely allied associates—chemistry, biology, physics—are entirely too far separated from clinical medicine. This separation is the more lamentable when we consider the amount of time students give to these branches, and the possibilities of progress in medicine if they made what they learned more available.

A glance at our best current medical literature reveals a strong trend toward investigation of capacity and function—leads that classical tissue pathology or bacteriology do not suffice to clarify. Witness the present studies, of considerable importance, of the blood chlorides in maintaining the water balance about the tissue cells—the basis of "Donnen's equilibrium."

In like manner, a number of articles have appeared on the use of novasurol, evidencing the astonishment of the clinicians at its influence in states associated with fluid accumulations in serous cavities. Improvement coming from its use cannot be ascribed to any intimate change within the heart or kidneys—organs supposedly primarily determining diuresis.

Perhaps the University of Paris is right when it takes its first year students directly into the wards. It would seem entirely more logical to study dyspnea or alkalosis from direct contact with a patient who is struggling for his breath, or one with acute dilatation of the stomach from lack of sufficient blood chloride, than to study them as abstract though interesting physiological phenomena.

E. L. T.

Ephedrine

Ephedrine well illustrates the old saying that there is nothing new under the sun, for the therapeutic qualities of this drug have been known for centuries by the Chinese but have only recently been called to the attention of American physicians. The drug promises to be a very valuable adjunct in the treatment of asthma.

Ephedrine is the alkaloidal active principle of a leafless shrub known botanically as *Ephedra equisetina* and the sulphate salt made in the laboratories of the Peking Union Medical College has been tested out clinically in this country. Although its clinical use has been so far rather limited it promises to serve a wide field of usefulness.

Just what happens in the lungs in an attack of asthma is largely a matter of speculation. A turgescence of the membranous lining of the bronchi rather than a spasm of the bronchial musculature probably takes place, this conception obtaining additional support from the prompt relief obtained with epinephrin. A sympathetic

nerve reflex undoubtedly plays a part and there is good reason to believe that specific protein sensitivity plays a rôle at least in some instances.

The characteristics and therapeutic action of this vegetable extract ephedrine closely resemble those of the biological extract epinephrin. Its administration subcutaneously, intramuscularly and intravenously produces much the same response as similar injections of epinephrin. It has the additional advantage, however, in that its effects are more prolonged and are obtained by oral administration.

Applied locally to mucous membranes 1 per cent solutions of ephedrine cause constriction of the capillaries and have proven of value in the symptomatic relief of hay fever sufferers. The use of cocain and epinephrin sprays in this condition has its obvious drawbacks, none of which this new drug seems to possess. Its action is more prolonged and less irritating locally.

A solution of ephedrine when instilled into the conjunctival sac acts as a mydriatic through stimulation of the sympathetic nerve fibers of the iris. It has been used in place of atropin and homatropin and its less prolonged action recommends it in place of the usual mydriatics.

Ephedrine has the additional property of raising blood pressure even when administered orally. Elevated blood pressure, therefore, is a distinct contra-indication for its use and caution should be exercised. Trials have failed to show, however, that the drug will maintain an elevation of blood pressure in conditions such as Addison's disease. Along with the elevation of the blood pressure the pulse is slowed. The central nervous system is sometimes distinctly stimulated and the wakefulness produced at times may be a distinct drawback to its use.

So far, the only preparation of ephedrine on the market is "Fedrin," put out by Eli Lilly and Company. This is ephedrine sulphate containing a small amount of pseudoephedrine (whatever that may be) and is put up in capsules containing 25 and 50 milligrams each. The average dose of the sulphate or hydrochlorid is 1 grain (65 milligrams). One physician reports having given over 200 milligrams in twenty-four hours to twenty patients, three of whom experienced nausea, bladder irritation and headache.

There is reason to believe that the drug may be administered in doses of 25 to 50 milligrams, sufficient to control asthmatic attacks and not enough to elevate blood pressure.

It should be remembered that the drug has as yet had only a limited trial and its acceptance by the Council of Pharmacy awaits more clinical use and further investigation.

X-Ray of the Lungs

Diagnostic *x*-ray of the lungs has been utilized long enough for the pendulum to have swung from the extremes of skepticism and overenthusiasm to its true status.

The older clinicians fifteen years ago were very skeptical of the ability of the fluoroscope to give any additional information over physical examination. With the development of the technic of lung roentgenograms it was thought possible to detect the very early stages of lung tuberculous infection. The roentgenogram came to be considered the final word in the diagnosis or exclusion of pulmonary tuberculosis.

During the influenza epidemic of 1918 and 1919 our eyes were opened to the unreliability of the roentgenogram alone in diagnosing pulmonary tuberculosis. Post-influenzal pneumonia was often found to reproduce exactly the *x*-ray picture of tuberculosis. The mottling which developed during pneumonic resolution could not be distinguished from a tuberculosis. The complete disappearance of abnormal shadows in these cases in time, a result inconceivable in a purely tuberculous lung infection, produced more conservatism in shadow-interpretation.

Those who heard Dr. Rist of Paris during his recent visit to the Twin Cities had their attention called to the frequency of sudden onset of pulmonary tuberculosis. In a series he had studied, onset with sudden febrile reaction and indications of an acute pulmonary infection was obtained in 48 per cent of the cases. In some patients seen early the entire upper lobe was found opaque under the fluoroscope and tubercle bacilli were found in the sputum. It is difficult to conceive of such a high percentage of tuberculous patients with this sort of onset purely tuberculous in origin. We have always felt that the disappearance of shadows in the plates of tuberculous individuals must be the resolution of non-tuberculous lesions accompanying tuberculous infection. Just as an acute broncho-pneumonia can exactly simulate a tuberculous lung lesion and completely disappear, a similar process accompanying a tuberculous lesion could similarly disappear.

Roentgenograms of acute pneumonia have not had the attention they deserve. The observa-

tions by Dr. Rigler which appear in this issue of the journal are, therefore, most interesting. The first appearance of the pneumonic process and its extension can be accurately followed by the *x*-ray and the existence of pneumonia which lasts three days or even one day and which may not present sufficient physical findings for a clinical diagnosis may be absolutely proven by *x*-ray means.

It should be emphasized that *x*-ray studies of the lungs are a laboratory procedure. Roentgenograms are the result of shadows produced by differences in tissue density. Diagnosis of lung conditions based on roentgenograms alone are absolutely unjustifiable and the roentgenogram, while it has clarified our conception of lung processes, must be interpreted along with the clinical history and physical and laboratory findings in any given case.

PROPOSED AMENDMENT TO HARRISON NARCOTIC ACT

A proposed amendment to the Harrison Narcotic Act provides that the Federal government can prescribe and regulate the administration of drugs with narcotic qualities, and as one writer says, "If this precedent is established there is no reason why the federal government cannot prescribe and regulate the administration of anything from bicarbonate of soda to mercury." The Harrison Narcotic Law was passed under the assumption that it would make it impossible for addicts to secure their supply of "dope," and to prevent unprincipled people from making fortunes and fattening upon the infirmities of their fellowmen. As is well known the law has fallen far short of its purpose, and the medical man is harassed at every turn in his efforts to secure narcotics for legitimate purposes. Under the proposed amendment every prescription issued by a physician for a narcotic drug will be subject to review by any pharmacist who may be called upon to fill it. If for any reason the dealer has reason to question the propriety of issuing the prescription he cannot lawfully fill it. In other words, the pharmacist is entrusted with statutory authority to refuse to any sick person medicine that the attending physician has prescribed. The absurdity of the whole proposition would be laughable if it were not dangerous, and the thing for the medical profession to do is to oppose this tampering with the rights and privileges of reputable and licensed physicians in the prescribing of drugs for the alleviation of the sick and suffering.—*J. Indiana M. A.*, August, 1926.

OBITUARY

Dr. John Nelson Risjord

Dr. John Nelson Risjord was born in Telemarken, Norway, December 22, 1863, coming to the United States in 1882, when he located at Mt. Horeb, Wisconsin. The following year he came to Fertile, Minn., where he practiced later, but remained only four years, the first time.

He returned to Norway, where he attended a seminary for a year, then back to Wisconsin, becoming a student at a business college in Madison for two years. After this he, with a partner, edited a newspaper at Mt. Horeb for three years.

Having sold out his interest in the paper he entered the Iowa Medical College, graduating in 1898. After a year of practice in Kenseth, Iowa, he again came to Fertile, this time taking up his work as a practitioner of medicine, which he continued in the same place for twenty-seven years, up to the time of his death, which occurred August 25, 1926.

Four children survive him, one, Miss Minnie, being a teacher at Hibbing. A son is practicing medicine in Chicago.

Dr. Risjord was one of the early settlers of Fertile, and had served his community both as a physician and a public-spirited citizen, having been, at various times, mayor, member of the council, and member of the board of health. He was always interested in the agricultural development of his portion of the state, having acquired considerable farm property during the years of his residence there.

For the twenty-seven years that he lived and worked in the community of Fertile and its environs he was building himself into the structure of the town so that every family, every activity and every institution will be a constant memorial to his faithfulness and industry.

Dr. Norman Barden

Norman Barden was born in Minneapolis, Minn., August 16, 1892. He graduated from East High School and attended the University of Minnesota. He received the degree of Doctor of Medicine from the University of Cincinnati Medical School in June, 1919, and served his interneship in St. Luke's Hospital in St. Paul. After this he engaged in general practice in Minneapolis until the time of his death, which occurred August 18, 1926, at the age of 34.

He was a member of Alpha Kappa Kappa and Alpha Omega Alpha fraternities and of the Hennepin County Medical Association. He was on the staff of St. Barnabas and Asbury Hospitals of Minneapolis.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

STEARNS-BENTON COUNTY MEDICAL SOCIETY

The Stearns-Benton County Medical Society met at Clearwater, Minnesota, Thursday, September 23, 1926, at 6:30 p. m. as the guests of Dr. E. M. Kingsbury of that place.

Dinner was served. After getting the returns of the Dempsey-Tunney fight over the radio the following program was given:

"Varicose Ulcers," Dr. Chas. S. Sutton, St. Cloud.
"Urinary Retention," Dr. W. L. Freeman, St. Cloud.
"Infant Feeding," Dr. W. B. Richards, St. Cloud.
"Post-operative Treatment," Dr. H. W. Goehrs, St. Cloud.

The October meeting was held at Little Falls, Thursday, the twenty-eighth, with the Upper Mississippi Society.

The November meeting will be held at Sauk Center, Nov. 18, 1926.

MINNEAPOLIS SURGICAL SOCIETY

The next meeting of the Minneapolis Surgical Society will be held at 8 p. m., on Thursday, November 11, 1926, at the Minneapolis General Hospital, 6th Avenue South and 5th Street. This meeting will consisf principally of the presentation of the more interesting surgical patients, a brief review of their histories, discussion of the cases, and a presentation of pathological specimens.

All members of the medical profession are cordially invited.

OF GENERAL INTEREST

Dr. R. H. Wald has severed his connection with Armour and Company, South Saint Paul, and is now located at 355 Lowry Building, Saint Paul, Minnesota.

Dr. Dudley W. Palmer of Cincinnati was elected president of the Association of Resident and Ex-resident Physicians of the Mayo Clinic at its eighth annual session held at Rochester, Minnesota, October 6, 1926. Dr. Palmer succeeds Dr. Otis F. Lamson of Seattle.

Other officers named were: Dr. William L. Estes, Jr., South Bethlehem, Pa., first vice president; Dr. James I. Scarborough, Little Rock, Ark., second vice president; Dr. G. J. Thomas, Minneapolis, general secretary, and Dr. R. D. Mussey, Rochester, secretary-treasurer.

Dr. M. S. Henderson was elected to the board of governors, succeeding Dr. D. C. Balfour of Rochester.

New members of the advisory board to fill vacancies left by five whose terms have expired are: Dr. W. C. Carroll, St. Paul; Dr. Ethan Flagg Butler, Sayre, Pa.; Dr. Eric Larson, Woodland, Calif.; Dr. Henry J. McKenna, Kansas City, and Dr. Robert Lee Sanders, to fill the unexpired term of Dr. Fred Rankin of Rochester.

The Mankato Clinic formally opened its new Clinic building, corner Main and Broad Streets, Mankato, Minnesota, Wednesday, Sept. 29, 1926. The Clinic consists of thirteen physicians and surgeons and was organized Jan. 1, 1916. The personnel of the different sections is as follows:

Internal Medicine—H. J. Lloyd, M.D., E. L. Schield, M.D., M. I. Howard, M.D.; Surgery—J. S. Holbrook, M.D., F.A.C.S., A. E. Sohmer, M.D., F.A.C.S., C. J. Holman, M.D., F.A.C.S., W. C. Stillwell, M.D.; Obstetrics and Pediatrics—G. A. Dahl, M.D., R. N. Andrews, M.D., M. I. Howard, M.D.; Eye, Ear, Nose and Throat—V. I. Miller, M.D., J. T. Schiesselman, M.D., E. W. Benham, M.D.; Radiology and Physiotherapy—A. J. Wenworth, M.D.; Orthopedics—J. S. Holbrook, M.D.; Urology—A. E. Sohmer, M.D.; Clinical Pathology—E. L. Schield, M.D.

Dr. Russell O. Lyday, who has been practicing in Brevard, North Carolina, since leaving the Mayo Clinic, Rochester, last spring, is now located in Greensboro, North Carolina.

The Children's Clinic of Minneapolis, which has been located at the Abbott Hospital for the past six years, has dissolved partnership and ceases to exist. Dr. N. O. Pearce and Dr. Rood Taylor have opened offices in the new Yeates building. Dr. F. C. Rodda and Dr. E. F. Robb are contemplating locating, in the near future, in new offices on Lyndale Avenue South, Minneapolis.

NEWS FROM THE MAYO CLINIC BULLETIN

Presentation of Memorial Tablet: The time usually devoted to the meeting of the general staff on Wednesday, September 29, was given over to the presentation of a bronze tablet commemorating Dr. Russell D. Carman, by the American Roentgen Ray Society. The presentation was made by Dr. E. H. Skinner, Kansas City, Chairman of Executive Council of the Society. Short talks were also given by Dr. A. W. Crane, Kalamazoo, and Dr. P. M. Hickey, Professor of Roentgenology, University of Michigan. Responses were made by Dr. W. J. Mayo, Dr. C. H. Mayo, and Dr. L. B. Wilson. Dr. A. B. Moore presided.

Lectures by Dr. Gans: The seminar in histopathology of the skin to be given by Dr. Oscar Gans, Professor of Dermatology and Dermatopathology, University of Heidelberg, began Monday, October 4. During his stay in Rochester Dr. Gans will also give a series of Mayo Foundation lectures.

Dr. J. W. Kernohan and Dr. H. W. Woltman sailed from New York early in October for Italy. They will visit the medical centers of Italy, Germany, and France, on their way to England. Dr. Kernohan will then go to his home near Belfast to remain until the first of next year. Dr. Woltman will spend some time studying in London, and then will return to the Continent for some work at Vienna and other cities which have important neurologic clinics. He will return to Rochester about the first of April.

Dr. William M. deVries, Professor of Pathology, University of Amsterdam, visited the Mayo Clinic for two days during the week of October 3.

Dr. R. Bierich, Director of the Cancer Institute of Hamburg, Germany, and *Dr. Archibald Leitch,* Director of the Cancer Hospital Research Institute, London, visited the Mayo Clinic during the week of October 3.

Dr. Bierich and Dr. Leitch came to this country to attend the International Cancer Symposium given by the American Society for the Control of Cancer at Lake Mohonk, New York, in September.

Meeting of The Mayo Foundation chapter of Sigma Xi: The Mayo Foundation chapter of Sigma Xi met at the Arthur Hotel Monday, October 11, at 6:00 p. m. The speaker of the evening was Dr. Joel Stebbins, Director of the Observatory, University of Wisconsin. His subject was "The Light of the Stars."

New Fellows in The Mayo Foundation: Twenty-nine new Fellows have been admitted to The Mayo Foundation for the quarter beginning October 4, 1926. Sixteen of these Fellows will major in surgery.

NEW AND NON-OFFICIAL REMEDIES

The following articles have been accepted by the Council on Pharmacy and Chemistry.

H. K. MULFORD COMPANY

Digitos

Digitos Ampules, 1 c.c.

Solution Pituitary Extract Surgical-Mulford

Ampules Solution Pituitary Extract Surgical-Mulford, 1 c.c.

PARKE, DAVIS & COMPANY

Ovarian Substance Soluble Extract-P. D. & Co.

Ampules Ovarian Substance Soluble Extract-P. D. & Co., 1 c.c.

E. R. SQUIBB & SONS

Ipral

Ipral Tablets, 2 grains

UNITED STATES RADIUM CORPORATION

Ampules Radium Chloride, 2 c.c.-United States Radium Corp. (radium element, 50 micrograms)

Ampules Radium Chloride, 2 c.c.-United States Radium Corp. (radium element, 2 micrograms). For Drinking Use

Erysipelas Streptococcus Antitoxin Concentrated-Squibb.—An antitoxic serum (Jour. A. M. A., Aug. 28, 1926, p. 671) prepared according to the method of K. E. Birkhaug under license of the School of Medicine and Dentistry of the University of Rochester. It is standardized so that 1 c.c. will neutralize at least 50,000 skin test doses of a toxin furnished by the licensor. The product is marketed in syringes containing 15 c.c. E. R. Squibb & Sons, New York.

Diphtheria Antitoxin, Purified, Concentrated-Lilly.—A diphtheria antitoxin concentrated (New and Non-official Remedies, 1926, p. 330) marketed in syringe containers of, respectively, 1,000, 3,000, 5,000, 10,000 and 20,000 units each. Eli Lilly & Co., Indianapolis, Ind.

Antistreptococcic Serum-Gilliland.—An antistreptococcus serum (New and Non-official Remedies, 1926, p. 339), also marketed in 20 c.c. syringes. The Gilliland Laboratories, Inc., Marietta, Pa.

Poison Oak Extract-Lederle (In Almond Oil).—A solution in almond oil of a substance extracted from the fresh leaves of poison oak (Rhus Diversiloba). It is used to relieve the symptoms of dermatitis due to contact with poison oak. The product is marketed in 1 c.c. syringes. Lederle Antitoxin Laboratories, New York. (Jour. A. M. A., Sept. 4, 1926, p. 757.)

Digitos.—A preparation of water-soluble active principles of digitalis leaves, containing not more than 7 per cent of alcohol. It is standardized so that 1 c.c. is fatal to a 250 gm. guinea-pig. The actions and uses of Digitos are the same as those of other digitalis preparations. It is suited for hypodermic, intramuscular and intravenous administration, but is not adapted for oral administration. Digitos is also marketed in 1 c.c. ampules. H. K. Mulford Co., Philadelphia.

Solution Pituitary Extract Surgical-Mulford.—A slightly acid aqueous solution containing the water-soluble principle or principles of the fresh posterior lobe of the pituitary body of cattle. It has twice the strength of solution of pituitary-U. S. P. X. The actions, uses and dosage of solution of pituitary are discussed in New and Non-official Remedies, 1926, pp. 281-283. The product is supplied in 1 c.c. ampules. H. K. Mulford Co., Philadelphia. (Jour. A. M. A., Sept. 25, 1926, p. 1037.)

PROCEEDINGS OF THE MINNESOTA ACADEMY OF MEDICINE

Meeting of September 15, 1926.

The regular monthly meeting of the Minnesota Academy of Medicine was held at the Town and Country Club on Wednesday evening, September 15, 1926, at 8 o'clock. Dinner was served at 7 o'clock.

The meeting was called to order by the President, Dr. H. L. Ulrich. There were 26 members present.

The minutes of the May meeting were read and approved.

Dr. Hynes, Secretary-Treasurer, read the reports of the Secretary and Treasurer for the year 1925 and 1926. These were approved. The Secretary-Treasurer also called the attention of the Academy to the amount in the Fellowship fund and suggested that the Academy work out some plan of offering a prize for original research work or a fellowship to be paid from the income of this fund. The Executive Committee was instructed to work out some plan and present the plan to the Academy for action.

The annual election of officers resulted in the following men being elected for the ensuing year:

President .....Dr. Frank E. Burch, St. Paul
Vice-President.....Dr. John E. Hynes, Minneapolis
Secy.-Treas.....Dr. Carl B. Drake, St. Paul

DR. ARTHUR T. MANN (Minneapolis) reported a case of Carcinoma of the Rectum, as follows:

I wish to report the case of a farmer 55 years of age. When he came in he was bronzed and fairly vigorous looking and yet he looked as though he had lost something under his tan. He said he had been perfectly well up to the 12th of July of this year. At that time he began to have a feeling of fullness in his stomach and began to lose the desire for food. He had lost 8 pounds in weight. He had always had two stools a day for years and from two to three stools were his normal. Since July he had begun to have from two to five stools a day. On the 20th of July (8 days after

he was conscious of any trouble) he had a pain in the epigastrium, just beneath the lower margin of the ribs, and went to bed. Hot water bottles and turpentine took care of that attack, but he never felt well after that time. We could get nothing further in his history except that he had a little difficulty with getting his food into his stomach and, as soon as it was there, he felt full. He presented a rounded mass in the right epigastrium which elevated the abdomen about one inch. It was hard and resistant and, while the entire abdomen was tight, I felt I could distinguish an edge which I thought might be the liver. I thought I could get a notch where the notch in the liver ought to be. The patient had no urinary trouble. The prostate was normal in shape and consistency, perhaps a little larger than usual. He complained of feeling very tight.

I put him through the series of *x*-rays with the following results: The swallowed food would stop at the level of the diaphragm; the esophagus filled with the barium and swelled to a size rather larger than normal (shown on film); with certain motions the barium meal would gush over into the stomach, showing that there was no real stricture at the cardia, and the stomach was pushed over to the left. Under the fluoroscope the stomach was seen pushed backwards, as well. The barium meal went through the stomach with the proper amount of speed, when it once was in the stomach. There was pressure from something which was pushing the organs apart in all directions.

(2nd *x*-ray shown.) This condition was always present and the barium was pushed over to the left of the fundus as though a large fist were thrust against it.

The blood count was normal. Hb. 80 per cent, leucocytes normal and white cells normal. The man looked and behaved like one who had something rather seriously wrong with him.

(3rd *x*-ray shown.) The diaphragm was pushed up so that it went up to the seventh rib on the right, posteriorly, and also was high on the left so that it had pushed his heart over out of line.

(4th *x*-ray shown.) The lower margin of the liver shows here a fairly normal line but lower than normal.

The spleen was nearly normal. I thought it was just slightly enlarged to percussion but not enough to call it greatly enlarged, i.e., it extended between the 9th and 12th ribs.

The main prominence was at the place where a cyst of the pancreas does present, but this did not feel like a cyst of the pancreas (it was too hard and its edge rather too definite) so I felt that we had an enlarged liver and not the pancreatic cyst which they were inclined to work out from the *x*-rays.

This man was willing to have anything done that would help him. He was willing to have an operation but I was not sure I wanted to operate because I could not see what an operation would do, unless to establish a diagnosis, so we kept him in the hospital a few days for further study. I examined the prostate again and, by raising him up on my fist, I could get above the prostate and could feel a mass in the region above the prostate and beginning at the top of the prostate. This, I felt, could be from the top of the prostate, or in the cul-de-sac, or, possibly, in the rectum itself. It was a smooth, flattened, truncate mass, broadening upwards and I was unable to reach the top of it. So my diagnosis at that time was "enlarged liver from secondary carcinoma; 75 per cent primary in the rectum and 25 per cent primary in the prostate."

The stools were examined. They were frothy and contained fat, and it seemed as though his pancreas might be at fault. He was given glucose and, two hours after, had 0.18 per cent blood sugar. 0.12 per cent is considered about normal so 0.18 per cent corroborated the notion that possibly the pancreas might be at fault. He started to have diarrhea and I decided no operative interference was justifiable. He rather rapidly lost strength. We had the diarrhea controlled within 24 hours and he felt a little better. We had another examination of the stool after he had been on a fat-free diet and we found it normal. His blood studies throughout were normal and showed none of the changes which might give us an enlarged liver. His weight was 167 pounds; his winter weight had been 175 pounds.

I had never seen a liver so tremendously enlarged from carcinomas as this one that was not nodular so that one could feel the nodules. I came to the conclusion that it was the liver that was pressing the stomach over and not the pancreas, and that explained his stoppage at the diaphragm, i.e., the cardia was pushed over so that it was like a sharply-bent ribbon and closed the esophagus like a valve. At that time I told the family just what I thought the diagnosis was.

The man suddenly got worse and died in the night. We had a postmortem, at which time we found it was carcinoma of the rectum. Here was a man almost gone from carcinoma of the rectum and who had had no symptoms he was conscious of until two months before his death. The liver weighed 5,250 grams, three times the normal. On section it was one mass of small carcinomas (secondary), none of them large, and only small patches of liver substance could be seen. I have never seen such an enormous liver from any other cause than carcinoma. The lumen of the bowel was smooth.

DISCUSSION

DR. HEAD: Was there occult blood in the stools?

DR. MANN: Yes, there was occult blood in the stools persistently, but we did not get the significance of that sufficiently. The increase in the blood sugar, after the administration of the glucose, probably was due to loss of liver function instead of the pancreas. The loss of liver function to a degree sufficient to influence the blood sugar test is so rare that this point is exceedingly interesting.

DR. ULRICH: Dr. Mann mentioned the glucose test as being 0.18 after 2 hours. In liver insufficiency the sugar level in the blood is low. When one takes out the liver the animal dies of hypoglycemia. It is quite possible in such a marked case of liver insufficiency (the liver studded with cancer nodules) that a glucose tolerance test would give one a diabetic curve.

DR. HERBERT JONES (Minneapolis) reported a case and showed *x*-rays of a case of traumatic rupture of the diaphragm.

DISCUSSION

DR. A. SCHWYZER: I have had two cases of traumatic rupture of the diaphragm. One had happened by a tree falling on a man when he was a young fellow. He had had that condition for many years (40 years) and was miserable. At times he had signs of obstruction. Finally he had so much discomfort that it was thought to be gallbladder trouble and the doctor took out his gallbladder. He finally had frequent attacks of intestinal obstruction. That case was operated on by first going into the abdomen. There was no small intestine to be found in the abdomen. We found the stomach and the diaphragm normal. No opening into the chest cavity was seen. We now followed the lower part of the duodenum and saw that from the duodenum the jejunum ran upward underneath the transverse mesocolon into a space behind the stomach. The entire small intestine and a loop of the large gut could be pulled down into the abdomen. *X*-ray pictures had shown that the gut reached to the 2nd rib. After all the intestines were replaced the chest wall was opened and a rent in the diaphragm was found. The gut thus had entered the chest behind the stomach. We had not seen anything abnormal at all when the diaphragm was examined from the abdominal side. A piece of fascia, which we took from the rectus sheath, was sewed over the rent in the diaphragm, which we had closed by interrupted sutures. The operation was about three years ago. The patient, whom I saw this early summer, is all right.

The other case was also traumatic. In the *x*-ray picture the transverse colon was seen to the right of the heart. The patient, who was a woman, had had an injury compressing her abdomen. The transverse colon came from the left over the left edge of the liver, and seemed to have a tendency to return from there even after the diaphragm had been sewed to the base of the ensiform process and the nearby muscular structures of the abdominal wall. Therefore, the left border of the liver, which had a tendency to fall down into the abdomen, was sewed to the corresponding portion of the diaphragm. This patient is also well.

A third case I saw when it was operated upon by Dr. Colvin. It was not of traumatic origin. The stomach was in a small cavity near the hiatus esophageus.

DR. H. L. ULRICH (Minneapolis) gave the President's Address, entitled "Some Aspects of Hypertension." This was illustrated with numerous lantern slides and charts.

DISCUSSION

DR. S. M. WHITE: Dr. Ulrich has given us a very instructive and entertaining presentation of the subject. The paper brings out one phase of it which interests us particularly because of the studies made in recent years of the effect of various substances on cell membranes. The work of Green has shown the variability in ease with which the red cells can have the membrane destroyed and the hemoglobin liberated in hemolysis, and he has shown that it is the effect of certain substances on the membrane of the red cell which makes them more friable.

Dr. Ulrich has suggested in his paper that in essential hypertension we may have substances which affect the membrane of the smooth muscle of the walls of the arterioles, rendering them less susceptible to the depressor substances supposed to act by relaxing the arteriolar walls. This hypothesis of Westphal and others is stimulating and interesting because we are beginning to understand some of those principles relating to surface tension function of cell membranes.

New fields are being opened up and it has been instructive to me to get the point of view which Dr. Ulrich presents in this connection because it may explain a certain alteration to emotional influences which appear to occur in hypertension. The lability of blood pressure, dependent on emotional factors, is often increased in the early stages and may become greatly diminished in the later stages of essential hypertension. He suggests a change in the cell and its membrane which alters its response to stimuli.

DR. J. W. BELL: President Ulrich's paper is a very interesting and instructive one. Essential hypertension is a problem we are all vitally concerned with. We are meeting with it more frequently the last decade and unfortunately in much younger persons.

I was quite surprised the early part of last month, in the case of a young, conscientious teacher, twenty-four years old, to find a systolic pressure of 225. This young, nervous woman was free from evidence of structural disease. Under complete rest and restricted diet, at the end of a fortnight the systolic registered 165 and diastolic 85. She then resumed her school work and yesterday, at the end of two weeks, it again registered 210 systolic.

Hypertension is a serious problem of apparently many angles. Owing to its increased frequency in the younger people, it demands careful consideration.

DR. A. SCHWYZER: I want to ask the Doctor about lecithin. Did you not say that we must know more about the chemistry of lecithin? We know the chemical constitution.

DR. ULRICH: There is no way of isolating it and estimating it at the present time.

I want to thank Dr. Bell and Dr. White for their discussion of my talk. We have got to find out why these muscle cells (in the precapillary area) change. We talk a lot about worry and the stress of modern life in the production of hypertension, but in the end it is the muscle cells which produce the pressure. Why do they do it? There must be some recognizable factor. I am practically giving Westphal's ideas in my paper and corroborating them in a small way by our work at the General Hospital.

If cholesterin is a factor then we are going back to our old-fashioned ideas about diet. There is no reason why we could not put these people on a nitrogen balanced diet and then keep them there. In cases where there is no hypercholesterinemia such a diet would be of no use.

I think we are approaching, as Dr. White said, a physiological clearness on this, rather than a discussion of doubts. Hormonal factors alone do not explain away the situation. The point I make of fixation of function is new. I have never seen it in literature. It is similar to fixation in the auricle. Fixation of smooth

muscle must be discussed in a broad way. We must learn more about smooth muscle physiology. We must get at the reason for this fixation before we can do anything in prevention and treatment.

The meeting adjourned.

CARL B. DRAKE, M.D.,
Secretary.

PROGRESS

Abstracts to be submitted to Section Supervisors.

Members are urged to abstract valuable articles which they run across in their reading and send the abstracts to the physicians in charge of the respective sections. In order to avoid duplication it would be well to communicate with one of the section supervisors before the article is abstracted.

GYNECOLOGY AND OBSTETRICS

SUPERVISORS:
ARCHIBALD L. McDONALD,
LYCEUM BLDG., DULUTH
L. W. BARRY,
LOWRY BLDG., ST. PAUL

RESEARCHES CONCERNING THE PHYSIOLOGY OF THE HUMAN AMNION: Dr. H. Keiffer, Brussels (Gynecologie et Obstetrique, Vol. XIV, No. 1). The author has noted that during the usual care of the new-born there is a fall in the rectal temperature from 37 degrees Centigrade to 35.5 Centigrade. He believes that hemolytic icterus of the new-born is largely due to this chilling. A series of 60 babies were treated to avoid chilling, being placed immediately in warm bassinets with no preliminary cleansing. There was no instance of hemolytic icterus in the series. It was observed that within eight to twelve hours the vernix caseosa had entirely disappeared and the skin was clear. After due consideration it was concluded that the vernix was actually absorbed through the skin, and that the vernix caseosa may be of value to the fetus and new-born.

After quoting the usual text-book version of the origin of the vernix, as an excretion of the fetal skin, the author introduces his own investigations and conclusions. Microscopic and microchemical studies have convinced him that the vernix caseosa is not formed in the fetal skin but is a product of the amnion cells. The cellular content of the vernix is comprised of desquamated amniotic cells rather than those of the fetal skin. The area of distribution of the vernix on the fetus is characteristic, namely on the back, in the folds of the groin, axillæ, etc., and is not universal, as might be expected if the substance were an excretion of the skin. He concludes that the vernix is essentially a secretion of the amniotic epithelium, and that the fetal skin contributes only a relatively small amount of desquamated epithelium and sebaceous material. He believes that the vernix has a beneficial effect upon the fetus and also upon the new-born, possibly in supplying fats, lipoids, and cholesterides which may play an antihemolytic rôle.

He states that care of the new-born should be limited to treatment of the eyes and tying of the cord, and placing at once in wool blankets with heat to prevent preliminary fall of temperature. In eight to twelve hours the vernix will have been absorbed and the preliminary cleansing may be done. He suggests the use of lanolin as being especially suited to the skin of the new-born.

A. L. McDONALD, M.D., F.A.C.S.

EXPERIMENTAL STUDIES ON THE TOXEMIAS OF PREGNANCY: Can Histamine Poisoning be regarded as the Etiological Factor? J. Hofbrauer, Baltimore (American Jour. Obstet. and Gyn., Vol. XII, No. 2). The author presents findings and conclusions of a series of experiments undertaken to study premature separation of the placenta, but which also have a direct bearing on certain toxemias, pernicious vomiting and eclampsia. The lesions in premature separation of the normally inserted placenta consist of intramuscular hemorrhages leading to a disassociation of muscle fibers, all due to changes in the smaller vessels. This, together with the shock which is out of proportion to the accompanying loss of blood, suggested the picture of experimental histamine poisoning. Because of similar features of placentation, pregnant guinea pigs were used, and the author was able to reproduce the exact pathological picture. Control experiments with histamine-free extracts were negative. In large carnivora, cats, gross changes were reproduced in the muscles similar to those described in the human uterus, by Williams and others. In the carnivora striking changes were found in the liver and kidney which were of interest in connection with hypothesis of a toxic cause of premature separation of the placenta and also in connection with other toxemias, notably pernicious vomiting and eclampsia.

On the basis of the above analogy he points out certain practical applications. Over-distension of the splanchnic vessels induces a condition of shock out of proportion to the amount of blood lost, and the first indication is to overcome the shock by transfusion or infusion of saline, etc. Operative work should be carried out under local anesthesia or nitrous oxide with free administration of oxygen.

Histamine is derived from histidin, a product of intermediate protein metabolism in animal tissues. Very slight deviation may be sufficient to produce poisons of the histamine group. Another series of experiments was conducted to study the effect of small doses of histamine given over a long period of time. They were able to produce characteristic changes in the liver, fatty degeneration and depletion of glycogen, and also degeneration in the kidneys. Some evidence was developed to show that these changes can be prevented or delayed by the simultaneous administration of insulin, and to a less extent by glucose.

While the first effect of histamine is a reduction of

arterial blood-pressure, he demonstrates that continued administration of small amounts causes a rise, either directly, or indirectly through the adrenals, at least under certain conditions. He also cites evidence to show that the blood changes in the several conditions run parallel to alterations in liver function.

On the basis of the author's reasoning he emphasizes the significance of a diminution of oxygen as a cause of tissue degeneration, particularly as regards the liver, and in fact, in relation to the entire chain of events in the toxemias in question. The free administration of oxygen and carbohydrates is therefore advised.

While as yet it has been impossible to positively identify histamine bodies in the blood of eclamptic patients, he refers to some suggestive work by Dr. K. C. Sun in this connection. Hofbauer suggests that such histamine bodies may arise from the breaking down of fetal ectoderm "Synctial Buds" broken off and lost in the maternal tissues. Their effect is more or less counteracted by secretions of the pituitary and adrenal. He presents a very interesting hypothesis and draws a number of valuable practical conclusions, many of which are well supported by clinical experience.

A. L. McDonald, M.D., F.A.C.S.

PEDIATRICS

SUPERVISORS:

CHESTER A. STEWART,
LA SALLE BLDG., MINNEAPOLIS

ROY N. ANDREWS,
MANKATO CLINIC, MANKATO

DIGITALIS THERAPY IN CARDIAC DECOMPENSATION IN CHILDREN: A. Wilmot Jacobsen, M.D., and Wilburt C. Davison, M.D. (Amer. Jour. of Diseases of Children, September, 1926). Digitalis is often believed to be ineffectual in the treatment of cardiac disease in children. The most probable explanation for this belief is that the doses commonly used have been too small, for McCullough and Rupe have demonstrated that both normal children and those suffering from heart disease require from 10 to 100 per cent more digitalis per pound of body weight than do adults before electrocardiographic or other signs of digitalization are produced.

The author's criterion of the desired effect of digitalis therapy was a loss of edema, and they considered nausea or a definite slowing of the rate of the heart as indications for stopping the administration of the drug.

When digitalis is given in sufficiently large doses, the loss of edema is accomplished within one week. It is also true that edema will disappear as a result of rest in bed without digitalis, but a long period is often necessary. The physical comfort of all patients is markedly increased by digitalis therapy.

The body weight, exclusive of edema, of the patients in this series varied from 33 to 86 pounds (from 15 to 39 kg.), and the usual initial dosage was 3 grains (0.2 gm.) of the dried leaves in capsules by mouth every four hours for six doses. The administration of digitalis was continued in doses of from 4 to 18 grains per day until nausea appeared. The daily excretion of digitalis in children is probably about 3 grains, as this amount may be given daily for long periods of time to children who have been digitalized without producing nausea or other signs which would indicate an increased accumulation of the drug in the body.

The average net amount required to produce complete digitalization was 0.5 grains per pound of body weight, or twice the quantity which is usually sufficient in adults.

Perhaps the simplest method of administration of digitalis in children is to give, regardless of the patient's age and body weight, 33 grains (0.2 gm.) of the dried leaves in capsules by mouth every six hours until nausea develops (usually after four to eight doses). As soon as nausea or marked slowing of the pulse occurs, the dose of digitalis should be reduced to 1½ grains (0.1 gm.) twice a day. However, should nausea or marked slowing of the pulse develop while this reduced dosage is being given, digitalis should be discontinued and not readministered until one to two days after all symptoms of intoxication have disappeared.

For patients who have been vomiting before digitalis therapy is begun, 30 minims (2 c.c.) of the tincture of digitalis diluted with 1 ounce (30 c.c.) of physiologic sodium chloride may be given by rectum every six hours until the pulse rate is definitely reduced (usually after four to eight doses). The amount should then be decreased to 15 minims (1 c.c.) of the tincture, diluted with 1 ounce (30 c.c.) of physiologic sodium chloride solution twice a day to replace the daily excretion.

This rectal dosage is equivalent to that outlined in the foregoing for oral administration, and the results obtained in patients to whom digitalis has been given by rectum indicate that the drug is equally well absorbed and tolerated.

R. N. Andrews, M.D.

LEAD POISONING IN CHILDREN: Charles F. McKhann, M.D. (Amer. Jour. of Diseases of Children, September, 1926). Lead poisoning is of relatively frequent occurrence in children. In the author's cases it has usually been associated with pica or with perverted appetite, which causes the ingestion of lead paint with resulting symptoms of anemia, abdominal pain, constipation and vomiting. In the more severe cases, encephalitis ensues, which is often confused with tuberculous meningitis or other forms of encephalitis. Unless proper therapeutic measures are promptly instituted, lead encephalitis is highly fatal.

The administration of calcium salts—calcium lactate by mouth and calcium chloride intravenously—has been demonstrated to produce prompt alleviation of symptoms. Our experience has confirmed these observations. However, the patient is subject to recurrences of acute symptoms of lead poisoning unless excretion of the lead

is effected by a deleading process, best accomplished by production of an acidosis, together with a diet low in calcium.

R. N. ANDREWS, M.D.

MAGNESIUM SULPHATE IN THE TREATMENT OF TETANUS NEONATORUM: Adeline F. Muelchi, M.D. (Amer. Jour. of Diseases of Children, September, 1926). Since the introduction of magnesium sulphate into the treatment of tetanus by Meltzer, numerous case reports have appeared in the literature, showing a decided reduction in mortality.

Bratusch-Marrain has reported a series of thirty-six cases of tetanus neonatorum, which occurred at the Kinderklinik in Graz from 1906 to 1923. These he divided into two groups: those who did not receive magnesium sulphate, and those who received the magnesium sulphate. In the first group were twenty-eight patients, only one of whom lived, giving a mortality rate of 96.5 per cent. In the second group were eight patients, seven of whom received subcutaneous injections of magnesium sulphate, with recovery in four, giving a mortality rate of 50 per cent. Holt gives the mortality rate of tetanus neonatorum as being between 90 and 95 per cent. There can be no question as to the part played by the magnesium sulphate in the second group.

In tetanus, death occurs during a paroxysm from heart-failure or asphyxia, or is due to exhaustion or to starvation. In infants, it is extremely important to keep up the nutrition. Subcutaneous injections of magnesium sulphate bring about enough relaxation to permit the infant to nurse. By reducing the convulsions, the body can in time throw off the combined toxin, and the antitoxin given combine with the free toxin.

The effect of magnesium sulphate in the treatment of tetanus neonatorum is purely symptomatic. It causes the relaxation and control of convulsions which other sedatives have failed to do, thus giving the body an opportunity to combat the disease.

It is valuable in the treatment of tetanus neonatorum, because it makes normal feeding possible and stops the vomiting.

The action apparently is not cumulative, as the dose can be repeated as soon as the effects of the previous dose have worn off.

Dose 0.2 gm. per kilogram of body weight in ten per cent solution.

R. N. ANDREWS, M.D.

CONCENTRATED FEEDING IN CHILDREN ABOVE THE AGE OF INFANCY: Henry Heiman, M.D., and Philip Cohen, M.D. (Archives of Pediatrics, August, 1926). Concentrated feeding in infancy has proven itself a successful method of feeding in the hands of those versed in its usage. Gains in weight have thus been obtained in babies which could not have been effected by the ordinary diluted milk formulæ with a caloric value less than that of cow's milk; that is, less than 20 calories to the ounce.

A mixture of about 20 calories to the ounce is normally concentrated; and formulæ with a fuel equivalent greater than 20 calories per ounce are concentrated.

At Mount Sinai Hospital, Schick, with the aid of the dietetic staff, has worked out a system of concentrated foods, where every article of food served is enriched to double the value of cow's milk; that is, 40 calories to the ounce. Thus an article of food like spinach, which is a useful adjunct to a child's diet, is practically devoid of caloric value as ordinarily served, yet when enriched with a sauce of cream, butter, sugar, and flour, will yield one hundred calories or so.

By concentrating every article of food in our concentrated diet; by the selection of foods of naturally high caloric value, the fats or foods rich in fats, like cream, sweet or sour, or foods purely carbohydrate, like sugars, or rich in carbohydrate, like bread and crackers; by recommending the vegetables and fruits of greatest caloric value, like plums, prunes, bananas, potatoes, peas, beans, olives, the authors were able to obtain in many cases a food ratio of about two calories per gram, on about twice the normal concentration.

All foods of the older child can be concentrated as the milk formulæ and cereals have been for infants. This concentrated diet is of great benefit to children with inherently poor appetite and limited food intake, the child with excessive caloric needs due to an inborn metabolic aberration, and to the overactive child, whose appetite is sated with a normal or subnormal volume of food. The nutritional status of these types of children have been improved in 50 per cent of the cases, which is better than previous methods achieved.

R. N. ANDREWS, M.D.

ROENTGENOLOGY

SUPERVISORS:
LEO G. RIGLER,
MPLS. GEN'L HOSPITAL, MINNEAPOLIS
A. U. DESJARDINS,
MAYO CLINIC, ROCHESTER

VERTEBRAL EPIPHYSITIS: Buchman (Jour. B. & J. Surg., Oct., 1925). This disease entity was first described by Andre Delahaye in 1924, at which time he reported 3 cases, in all of which the superior and inferior epiphyseal areas of ossification of the vertebral bodies show anomalies of location, form, and tenderness, without gross deformities. Buchman's study attempts to establish a relationship between abnormal changes in the superior and inferior vertebral epiphyses and the acquired deformities of adolescence.

The author observes that, normally, the superior and inferior vertebral epiphyses appear at about eleven and one-half years of age. Any gross deviation from their time or order of appearance, the presence of tenderness, and abnormal x-ray findings are pathologic. The pathologic x-ray findings are: The epiphyses become enlarged, moth eaten, frayed, and indistinct, the vertebral spaces become cloudy, mottled, and irregular; the vertebral outlines becomes indistinct; all of these parts

then tend to fuse into one indistinguishable mass. This is followed by the stage of regression, in which the process is reversed. These characteristic appearances are found in a disease entity, occurring between the ages of ten and twenty-one, and characterized clinically by sensation of fatigue, backache, and tenderness of epiphyses. Many of these cases develop deformities of the spine.

The etiology is unknown. It is thought to be a very low grade infection in the spine. The condition is analogous to Legg-Perthes' disease, Osgood-Schlatter's disease, Koehler's disease, and similar conditions, and forms part of a greater entity: Multiple Epiphysitis of Adolescence.

WALTER H. UDE, M.D.

THE DUODENAL NICHE: Carman & Sutherland (Am. Jour. Roent., Aug., 1926). The literature is briefly reviewed, showing the variance among different observers in the incidence of the niches. This variance is due evidently to differing conceptions of what constitutes the true niche. Another factor is the variation in the class of patients sent for roentgenologic examination, in some clinics there being a majority of frank old ulcer cases, while other clinics have a large proportion of patients with vague abdominal complaints in whom the demonstration of the duodenal niche would be rare.

An analysis is made of a series of 1,658 cases of duodenal ulcer observed at the Mayo Clinic during the year 1925, in which niches were seen in only 220, or 13.27 per cent. Surgical investigation was carried out in 100 of the 220 cases, and ulcers were found in 98, in the other two cases the duodenum being unopened because of the coexisting disease of the gallbladder.

The authors emphasize the importance of the niche as a diagnostic finding, and publish a series of figures illustrating that a considerable proportion of the ulcers would not have been discovered without this sign. A number of these show bulbs which were practically normal roentgenographically, but revealed niches roentgenoscopically which were found at operation.

WALTER H. UDE, M.D.

NUMOQUIN NOT ACCEPTABLE FOR N. N. R.

The Council on Pharmacy and Chemistry reports that Numoquin is the proprietary, non-descriptive, therapeutically suggestive name under which Merck & Co. markets ethylhydrocupreine. Ethylhydrocupreine is a synthetic derivative of cupreine, an alkaloid occurring together with quinine in cuprea bark. The Council reports that ethylhydrocupreine has the antimalarial and anesthetic action of quinine, but that toxic symptoms are more liable to occur. Merck & Co. advertise Numoquin for use in the treatment of pneumonia. The evidence for this recommendation is practically of no value. The Council found Numoquin unacceptable for New and Non-official Remedies because the drug is marketed with unwarranted therapeutic claims and under a name that is therapeutically suggestive. (Jour. A. M. A., Sept. 25, 1926, p. 1055.)

EYE, EAR, NOSE AND THROAT

SUPERVISORS:
VIRGIL J. SCHWARTZ,
PHYS. & SURG. BLDG., MINNEAPOLIS

E. L. ARMSTRONG,
FIDELITY BLDG., DULUTH

SOME OF THE MORE DIFFICULT PROBLEMS IN THE MANAGEMENT OF PTERYGIA: J. O. McReynolds, Jackson Birthday Volume. Irritating atmospheric conditions, such as heat, dust and high winds, are the chief cause of a thickening of the bulbar conjunctiva in the interpalpebral fissure, encroaching on the cornea. These conditions must be avoided afterward to prevent recurrences. When these latter do occur, especially if repeatedly, the prognosis becomes steadily worse due to the large amount of scar tissue, and we must now deal with a keloid or a symblepharon, at times causing limitation of ocular movement and double vision.

Ordinary operative methods will not suffice in such cases. In moderately scarred cases the conjunctiva must be dissected up carefully from the subjacent cicatrix and saved so far as possible. The scar tissue is then completely removed from the sclera and cornea, thus giving the eyeball free motion, taking care not to injure the medial rectus. The conjunctiva is then sutured over and directly to the denuded sclera to obtain firm adhesion between these two. In this way vessels from the caruncle to the cornea are obliterated.

If there is a great amount of scarring and less available conjunctiva, a graft from another person's conjunctiva or from the epithelium on the inner surface of the arm may be used to cover the sclera. Rarely there is so much scarring and so little conjunctiva that operation is not indicated.

Of possible complications, corneal ulcer might be thought common, yet it is actually rarely seen. Careful preoperative preparation, the use of other local anesthetics than cocaine, local heat, and miotics to prevent corneal stasis, will help prevent further complication. In old people, glaucoma has occurred, following the prolonged use of cocaine. Iritis and cyclitis, following a keratitis, have occasionally been seen. Mild, subconjunctival suppuration in the anterior part of the eyeball, near the stitch, may sometimes take place; prompt removal of the suture, incision, hot applications and local antiseptics always effect a quick recovery.

A pterygium which is advancing rapidly or is vascular ("pterygium crassum") should be given a guarded prognosis unless the conditions which brought it on can be obviated. Elimination of the underlying causes is the important thing. With the thin, stationary, nonvascular type the prognosis is very favorable.

VIRGIL J. SCHWARTZ, M.D.

BOOK REVIEWS

BOOKS RECEIVED FOR REVIEW

THE TREATMENT OF FRACTURES: WITH NOTES UPON A FEW COMMON DISLOCATIONS. Charles L. Scudder, M.D., Consulting Surgeon to the Massachusetts General Hospital, formerly Assistant Professor of Surgery at the Harvard Medical School. Tenth edition, revised. 1,240 pages. Illus. Cloth, $12.00. Philadelphia and London: W. B. Saunders Company, 1926.

PRACTICAL HELPS IN THE STUDY AND TREATMENT OF HEAD INJURIES. Adolph M. Hanson, M.D., formerly neurosurgeon to Evacuation Hospital No. 8, A. E. F. 109 pages. Illus. Cloth, $3.00. Boston: Richard G. Badger, The Gorham Press, 1926.

A PRACTICE OF PHYSIOTHERAPY. C. M. Sampson, M.D., formerly of the Physiotherapy Service, Walter Reed U. S. Army General Hospital, Washington, D. C., etc. 620 pages. Illus. Cloth, $10.00. St. Louis: C. V. Mosby Company, 1926.

THE SURGICAL TREATMENT OF GOITER. Willard Bartlett, A.B., M.D., D.Sc., F.A.C.S. Foreword by Dr. Charles H. Mayo. 365 pages. Illus. Cloth, $8.50. St. Louis: C. V. Mosby, 1926.

GOITER AND OTHER DISEASES OF THE THYROID GLAND. Arnold S. Jackson, M.D. 401 pages. Illus. Cloth, $10.00. New York: Paul B. Hoeber, Inc., 1926.

DEFECTIVE MEMORY, ABSENTMINDEDNESS, AND THEIR TREATMENT. Arnold Lorand, M.D., Carlsbad, Czechoslovakia. 340 pages. Cloth, $3.00. Philadelphia: F. A. Davis Company, 1926.

PRACTICAL DIETETICS FOR ADULTS AND CHILDREN IN HEALTH AND DISEASE. Sanford Blum, A.B., M.S., M.D., Head of Department of Pediatrics and Director of the Research Laboratories, San Francisco Polyclinic and Postgraduate School. 2nd revised edition. 362 pages. Cloth, $4.00. Philadelphia: F. A. Davis Company, 1926.

THE TREATMENT OF KIDNEY DISEASES AND HIGH BLOOD PRESSURE. Part I. Frederick M. Allen, M.D. 210 pages. Morristown, N. J.: The Physiatric Institute, 1925.

Summarizing the theme and motive of this work in the preface, Dr. Allen presents the essential disturbances of renal-vascular disease, namely, nitrogen retention, edema and hypertension, and their most important remedies, protein and salt restriction. Briefly, and concisely, yet comprehensively, the author discusses the present status of renal-vascular disease as it particularly concerns the kidneys, and emphasizes the fact that this is not an inevitably progressive condition, but one for which much may be done by proper therapy, particularly dietary. Great stress is laid on the benefits to be obtained from the use of the low salt and low protein diets, scientifically and accurately regulated, the poor results with their use by some men being attributed to insufficient or too great restriction of these food elements.

Recognizing the difficulties associated with dietary regulation, the author goes carefully into the problems of food selection, especially variety and palatability, and sample diet lists are given which have proven successful in his hands.

The author advocates the use of the low salt diet in hypertension and edema, and of the low protein diet in cases with nitrogen retention as indicated by high blood urea content, based on a carefully controlled use of these measures over a period of six years. Recognizing the opposition to these measures recorded by able medical men, Dr. Allen still feels that they are destined to revolutionize the treatment of hypertension, and, if he is mistaken, is prepared to bear the consequences.

The reviewer feels that the work is a valuable contribution toward clarifying the status and understanding of renal-vascular disease, with the able presentation of a rational method of treatment, well worth the consideration of every practitioner of medicine.

JOSEPH M. BORG, M.D.

OFFICE SPACE for rent in Yeates Building, 823 Nicollet Avenue, Minneapolis. Three large rooms in conjunction with dentist. Rent $45.00. Address C-97, care MINNESOTA MEDICINE.

OFFICE SPACE for rent in new downtown building with group of Physicians. Two large rooms and waiting room. X-Ray and Clinical Laboratory facilities in connection. Price $50.00 per month. Oculist and Aurist or Pediatrician preferred. Address C-95, care MINNESOTA MEDICINE.

WANTED—Assistantship to surgeon or position as surgical resident in hospital. M.D. from University of Minnesota, 1926. Address C-96, care MINNESOTA MEDICINE.

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